

<b>SOLICITATION, OFFER AND AWARD</b>		1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 350)		RATING <b>DO-A7</b>	PAGE OF <b>1   23</b> PAGES
2. CONTRACT NO.		3. SOLICITATION NO. <b>N00173-01-R-RS02</b>		4. TYPE OF SOLICITATION <input type="checkbox"/> SEALED BID (IFB) <input checked="" type="checkbox"/> NEGOTIATED (RFP)	
				5. DATE ISSUED <b>04 JUN 01</b>	
7. ISSUED BY Procuring Contracting Officer, Code 3235:RDS Naval Research Laboratory, SSC Department of the Navy Stennis Space Center, MS 39529-5004		CODE <b>N00173</b>		6. REQUISITION/PURCHASE NO.	
				8. ADDRESS OFFER TO (If other than Item 7)	

NOTE: In sealed bid solicitations "offer" and "offeror" mean "bid" and "bidder".

### SOLICITATION

9. Sealed offers in original and 4 copies for furnishing the supplies or services in the Schedule will be received at the place specified in Item 8, or if handcarried, in the depository located in Bldg. 1007, Rm.45, SSC, MS, 39529-5004 until 3:30 local time 05 JUL 01  
(Hour) (Date)

CAUTION - LATE Submissions, Modifications, and Withdrawals: See Section L, Provision No. 52.214-7 or 52.215-10. All offers are subject to all terms and conditions contained in this solicitation.

10. FOR INFORMATION CALL:	A. NAME <b>Richard D. Sewell</b>	B. TELEPHONE NO. (Include area code) (NO COLLECT CALLS) <b>(228) 688-5784</b>
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### OFFER (Must be fully completed by offeror)

NOTE: Item 12 does not apply if the solicitation includes the provisions at 52.214-16, Minimum Bid Acceptance Period.

12. In compliance with the above, the undersigned agrees, if this offer is accepted within \_\_\_\_\_ calendar days (60 calendar days unless a different period is inserted by the offeror) from the date for receipt of offers specified above, to furnish any or all items upon which prices are offered at the price set opposite each item, delivered at the designated point(s), within the time specified in the schedule.

13. DISCOUNT FOR PROMPT PAYMENT (See Section I, Clause No. 52-232-8)	10 CALENDAR DAYS	20 CALENDAR DAYS	30 CALENDAR DAYS	CALENDAR DAYS
	%	%	%	%
14. ACKNOWLEDGMENT OF AMENDMENTS (The offeror acknowledges receipt of amendments to the SOLICITATION for offerors and related documents numbered and dated:	AMENDMENT NO.		DATE	

15A. NAME AND ADDRESS OF OFFEROR	CODE	FACILITY	16. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER (Type or print)

15B. TELEPHONE NO. (Include area code)	15C. CHECK IF REMITTANCE ADDRESS IS DIFFERENT FROM ABOVE - ENTER SUCH ADDRESS IN SCHEDULE. <input type="checkbox"/>	17. SIGNATURE	18. OFFER DATE

### AWARD (To be completed by Government)

19. ACCEPTED AS TO ITEMS NUMBERED	20. AMOUNT	21. ACCOUNTING AND APPROPRIATION	
22. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION: <input type="checkbox"/> 10 U.S.C. 2304(c) ( ) <input type="checkbox"/> 41 U.S.C. 253(c) ( )		23. SUBMIT INVOICES TO ADDRESS SHOWN IN (4 copies unless otherwise specified)	
		ITEM	
24. ADMINISTERED BY (If other than Item 7) CODE		25. PAYMENT WILL BE MADE BY CODE	
26. NAME OF CONTRACTING OFFICER (Type or print)		27. UNITED STATES OF AMERICA	
		(Signature of Contracting Officer)	
		28. AWARD DATE	

IMPORTANT - Award will be made on this Form, or on Standard Form 26, or by other authorized official written notice.

**PART I - THE SCHEDULE**  
**SECTION B**  
**SUPPLIES OR SERVICES AND PRICES/COSTS**

**B-1 SUPPLIES OR SERVICES AND PRICES/COSTS**

ITEM NUMBER	SUPPLIES OR SERVICES	QTY	UNIT	UNIT PRICE	AMOUNT
0001	Full Sky Astrometric Mapping Explorer Inertial Measurement Units	2	EA	\$	\$
0002	Reports, Drawings and Technical Data DD 1423, Contract Data Requirements List, Exhibit A	1	LOT	NSP	NSP

TOTAL DOLLAR AMOUNT FOR CLINS\*: \$

\*CONTRACT LINE ITEM NUMBER

**SECTION C**  
**DESCRIPTION/SPECIFICATIONS/STATEMENT OF WORK**

**C-1** Items furnished under this contract shall comply with Attachment (1), Specifications with Exhibit A, DD Form 1423, Contracts Data Requirements List, and all other Attachments cited in Section J, which are incorporated by reference into Section C.

**C-2 REQUIREMENTS FOR ON-SITE CONTRACTORS**

For those portions of the work under this contract performed at any NRL site, the contractor shall comply with the Requirements for On-Site Contractors dated 11 April 2000 which are hereby incorporated by reference. The full text is available at <http://heron.nrl.navy.mil/contracts/home.htm>.

**SECTION D**  
**PACKAGING AND MARKING**

**D-1** Preservation, packaging, packing and marking of all deliverable contract line items must conform to normal commercial packing standards to assure safe delivery at destination.

**D-2** The Contractor shall mark all shipments under this contract in accordance with the edition of ASTM-D-3951-90 "Standard Practice for Commercial Packaging" in effect on the date of the contract.

## SECTION E INSPECTION AND ACCEPTANCE

### E-1 INSPECTION AND ACCEPTANCE CLAUSES BY REFERENCE:

#### FAR CLAUSE    TITLE

- |           |   |   |
|-----------|---|---|
| 52.246-2  | - | Inspection Of Supplies - Fixed -Price (AUG 1996)                |
| 52.246-4  | - | Inspection Of Services - Fixed Price (AUG 1996)                 |
| 52.246-7  | - | Inspection Of Research And Development - Fixed Price (AUG 1996) |
| 52.246-9  | - | Inspection Of Research And Development (Short Form) (APR 1984)  |
| 52.246-16 | - | Responsibility For Supplies (APR 1984)                          |

#### DFARS CLAUSE    TITLE

- |              |   |   |
|--------------|---|---|
| 252.246-7000 | - | Material Inspection And Receiving Report (DEC 1991) |
|--------------|---|---|

### E-2 INSPECTION AND ACCEPTANCE

Inspection and acceptance of the final delivery will be accomplished by the Technical Manager (TM) or Contracting Officer Representative (COR) designated in Section G of this contract . Inspection and acceptance will be performed at the Naval Research Laboratory, Washington DC 20375-5320.

Constructive acceptance, in accordance with FAR 32.905 (a) (1), shall be deemed to have occurred on the day after the final delivery.

## SECTION F DELIVERIES OR PERFORMANCE

### F-1 DELIVERIES OR PERFORMANCE CLAUSES BY REFERENCE:

#### FAR CLAUSE    TITLE

- |           |   |   |
|-----------|---|---|
| 52.211-11 | - | Liquidated Damages - Supplies, Services, Or Research And Development (APR 1984)(fill in _____)                              |
| 52.211-16 | - | Variation In Quantity (APR 1984) - The permissible variation shall be limited to: Percent increase/decrease (fill in _____) |
| 52.211-17 | - | Delivery Of Excess Quantities (SEP 1989)  |
| 52.242-15 | - | Stop-Work Order (AUG 1989)  |
| 52.242-17 | - | Government Delay Of Work (APR 1984)   |
| 52.247-34 | - | F.O.B. Destination (NOV 1991)   |

**F-2 FAR 52.211-8 - TIME OF DELIVERY (JUN 1997)**

- (a) The Government requires delivery to be made according to the following schedule:

**REQUIRED DELIVERY SCHEDULE**

<u>Item Number</u>	<u>Quantity</u>	<u>Within Days After Date Of Contract Award</u>
0001	2	NLT 30 SEP 2002
0002	**	**

(\*\* - In accordance with Exhibit A)

The Government will evaluate equally, as regards time of delivery, offers that propose delivery of each quantity within the applicable delivery period specified above. Offers that propose delivery that will not clearly fall within the applicable required delivery period specified above, will be considered nonresponsive and rejected. The Government reserves the right to award under either the required delivery schedule or the proposed delivery schedule, when an offeror offers an earlier delivery schedule than required above. If the offeror proposes no other delivery schedule, the required delivery schedule above will apply.

**OFFEROR'S PROPOSED DELIVERY SCHEDULE**

<u>Item Number</u>	<u>Quantity</u>	<u>Within Days After Date Of Contract Award</u>
0001	2	
0002	**	**

- (b) Attention is directed to the Contract Award provision of the solicitation that provides that a written award or acceptance of offer mailed, or otherwise furnished to the successful offeror, results in a binding contract. The Government will mail or otherwise furnish to the offeror an award or notice of award not later than the day award is dated. Therefore, the offeror should compute the time available for performance beginning with the actual date of award, rather than the date the written notice of award is received from the Contracting Officer through the ordinary mails. However, the Government will evaluate an offer that proposes delivery based on the Contractor's date of receipt of the contract or notice of award by adding (i) five calendar days for delivery of the award through the ordinary mails or (ii) one working day if the solicitation states that the contract or notice of award will be transmitted electronically. (The term "working day" excludes weekends and U.S. Federal holidays.) If, as so computed, the offered delivery date is later than the required delivery date, the offer will be considered nonresponsive and rejected.

**F-3 PLACE OF DELIVERY - FOB DESTINATION**

The contractor shall deliver supplies, all transportation charges paid, to destination in accordance with the clause in Section F of the Schedule titled FAR 52.247-34 FOB Destination (NOV 1991).

Receiving Officer

Naval Research Laboratory

Contract Number

ATTN: \*

CODE: \*

LOCATION: \*

Bldg. 49

4555 Overlook Avenue, SW

Washington DC 20375-5320

(\* To be filled in at time of award.)

**SECTION G**  
**CONTRACT ADMINISTRATION DATA**

**G-1    PROCURING OFFICE REPRESENTATIVE**

In order to expedite administration of the contract, the Administrative Contracting Officer (ACO) will direct inquiries to the appropriate office listed below. Please do not direct routine inquiries to the person listed in Item 20A on Standard Form 26.

Contract Matters- \*

Security Matters- \*

Safety Matters- \*

Patent Matters- \*

Release of Data- \*

The ACO will forward invention disclosures and reports directly to the Associate Counsel for Patents, Code 1008.2, Naval Research Laboratory, Washington DC 20375-5320. The Associate Counsel for Patents will return the reports along with a recommendation to the Administrative Contracting Officer. The Associate Counsel for Patents will represent the Contracting Officer with regard to invention reporting matters arising under this contract.

( \* To be filled in at time of award)

**G-2    TECHNICAL MANAGER - FUNCTIONS AND LIMITATIONS**

\* is hereby designated the cognizant Technical Manager who will represent the Contracting Officer in the administration of technical details within the scope of this contract and inspection and acceptance. The Technical Manager is not otherwise authorized to make any representations or commitments of any kind on behalf of the Contracting Officer or the Government. The Technical Manager does not have the authority to alter the Contractor's obligations or change the specifications in the contract. If, as a result of technical discussions, it is desirable to alter contract obligations or statements of work, a modification must be issued in writing and signed by the Contracting Officer. The Technical Manager, after review and signature of the "Material Inspection and Receiving Report, DD Form 250, If applicable, will forward a copy to the Administrative Contracting Officer.

(\* To be filled in at time of award)

**G-3 NAPS 5252.232-9000 - SUBMISSION OF INVOICES (FIXED PRICE) (JUL 1992)**

- (a) "Invoices" as used in this clause does not include contractor's requests for progress payments.
- (b) The contractor shall submit original invoices with 4 copies to the address identified in the solicitation/contract award form (SF 26-Block 10; SF 33-Block 23; SF 1447-Block 14), unless delivery orders are applicable, in which case invoices will be segregated by individual order and submitted to the address specified in the order (DD 1155-Block 13 or SF 26-Block 10).
- (c) The use of copies of the Material Inspection and Receiving Report (MIRR), DD Form 250, as an invoice is encouraged. DFARS Appendix F-306 provides instructions for such use. Copies of the MIRR used as an invoice are in addition to the standard distribution stated in DFARS F-401.
- (d) In addition to the requirements of the Prompt Payment clause of this contract, the contractor shall cite on each invoice the contract line item number (CLIN); the contract subline item number (SLIN), if applicable; the accounting classification reference number (ACRN) as identified on the financial accounting data sheets, and the payment terms.
- (e) The contractor shall prepare:
- ☐ a separate invoice for each activity designated to receive the supplies or services.
  - ☐ a consolidated invoice covering all shipments delivered under an individual order.
  - ☐ either of the above.
- (f) If acceptance is at origin, the contractor shall submit the MIRR or other acceptance verification directly to the designated payment office. If acceptance is at destination, the consignee will forward acceptance verification to the designated payment office.

**G-4 INVOICING ADDRESS**

With reference to paragraph (b) of the above provision, "Submission of Invoices(Fixed Price)", the contractor shall submit invoices to the address in Block 12 of the contract award form (SF26).

**SECTION H  
SPECIAL CONTRACT REQUIREMENTS**

**H-1 TYPE OF CONTRACT**

(To be filled in at time of award)

**H-2 REPRESENTATIONS AND CERTIFICATIONS**

The Contractor's completed Representations, Certifications, and Other Statements of Offerors or Respondents is incorporated herein by reference in any resultant award.



**PART II - CONTRACT CLAUSES**  
**SECTION I**  
**CONTRACT CLAUSES**

**I-1 52.252-2 - CLAUSES INCORPORATED BY REFERENCE (FEB 1998)**

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available.

Also, the full text of a clause may be accessed electronically at this/these address(es):

<http://www.arnet.gov/far>

<http://heron.nrl.navy.mil/contracts/home.htm>

**a. FEDERAL ACQUISITION REGULATION CLAUSES**

<u>FAR CLAUSE</u>	<u>TITLE</u>
52.202-1	- Definitions (MAR 2001)
52.203-3	- Gratuities (APR 1984)
52.203-5	- Covenant Against Contingent Fees (APR 1984)
52.203-6	- Restrictions On Subcontractor Sales To The Government (JUL 1995)
52.203-7	- Anti-Kickback Procedures (JUL 1995)
52.203-8	- Cancellation, Rescission, And Recovery Of Funds For Illegal Or Improper Activity (JAN 1997)
52.203-10	- Price Or Fee Adjustment For Illegal Or Improper Activity (JAN 1997)
52.203-12	- Limitation On Payments To Influence Certain Federal Transactions (JUN 1997)
52.204-4	- Printed Or Copied Double-Sided On Recycled Paper (AUG 2000)
52.209-6	- Protecting The Government's Interest When Subcontracting With Contractors Debarred, Suspended, Or Proposed For Debarment (JUL 1995)
52.211-5	- Material Requirements (OCT 1997)
52.211-15	- Defense Priority And Allocation Requirements (SEP 1990)
52.215-2	- Audit And Records-Negotiation (JUNE 1999)
52.215-8	- Order Of Precedence - Uniform Contract Format (OCT 1997)
52.215-14	- Integrity Of Unit Prices (OCT 1997)
52.215-17	- Waiver Of Facilities Capital Cost Of Money (OCT 1997) ( <i>will be included if the successful offeror does not propose facilities capital cost of money</i> )
52.215-21	- Requirements For Cost And Pricing Data Or Information Other Than Cost Or Pricing Data - Modifications (OCT 1997) - Alternate IV (OCT 1997)
52.219-4	- Notice Of Price Evaluation Preference For HUBZone Small Business Concerns (JAN 1999) <input type="checkbox"/> Offeror elects to waive the evaluation preference.
52.219-8	- Utilization Of Small Business Concerns (OCT 2000)
52.219-9	- Small Business Subcontracting Plan (OCT 2000)
52.219-16	- Liquidated Damages - Subcontracting Plan (JAN 1999)
52.219-25	- Small Disadvantaged Business Participation Program-Disadvantaged Status And Reporting (OCT 1999)

- 52.222-1 - Notice To The Government Of Labor Disputes (FEB 1997)
- 52.222-3 - Convict Labor (AUG 1996)
  
- 52.222-4 - Contract Work Hours And Safety Standards Act-Overtime Compensation (SEP 2000)
- 52.222-19 - Child Labor – Cooperation With Authorities And Remedies (FEB 2001)
- 52.222-20 - Walsh-Healey Public Contracts Act (DEC 1996)
- 52.222-21 - Prohibition of Segregated Facilities (FEB 1999)
- 52.222-26 - Equal Opportunity (FEB 1999)
- 52.222-35 - Affirmative Action For Disabled Veterans And Veterans Of The Vietnam Era (APR 1998)
- 52.222-36 - Affirmative Action For Workers With Disabilities (JUN 1998)
- 52.222-37 - Employment Reports On Disabled Veterans And Veterans Of The Vietnam Era (JAN 1999)
- 52.223-6 - Drug-Free Workplace (MAR 2001)
- 52.223-14 - Toxic Chemical Release Reporting (OCT 2000)
- 52.225-8 - Duty-Free Entry (FEB 2000)
- 52.225-13 - Restrictions On Certain Foreign Purchases (JUL 2000)
- 52.226-1 - Utilization Of Indian Organizations And Indian-Owned Economic Enterprises (JUN 2000)
  
- 52.227-1 - Authorization And Consent (JUL 1995)
- 52.227-2 - Notice And Assistance Regarding Patent And Copyright Infringement (AUG 1996)
- 52.227-3 - Patent Indemnity (APR 1984)
  
- 52.227-11 - Patent Rights - Retention By The Contractor (Short Form) (JUN 1997) *(will be included if the successful offeror is a small business or a non-profit organization)*
- 52.227-12 - Patent Rights - Retention By The Contractor (Long Form) (JAN 1997) *(will be included if the successful offeror is not a small business or a non-profit organization)*
- 52.229-3 - Federal, State, And Local Taxes (JAN 1991)
- 52.229-5 - Taxes - Contracts Performed In U.S. Possessions Or Puerto Rico (APR 1984)
- 52.230-2 - Cost Accounting Standards (APR 1998)
- 52.230-3 - Disclosure And Consistency Of Cost Accounting Practices (APR 1998)
- 52.230-6 - Administration Of Cost Accounting Standards (NOV 1999)
- 52.232-1 - Payments (APR 1984)
- 52.232-8 - Discounts For Prompt Payment (MAY 1997)
- 52.232-9 - Limitation On Withholding Of Payments (APR 1984)
- 52.232-11 - Extras (APR 1984)
  
- 52.232-17 - Interest (JUN 1996)
- 52.232-23 - Assignment Of Claims (JAN 1986)
- 52.232-25 - Prompt Payment (MAR 2001)
- 52.232-33 - Payment By Electronic Funds Transfer-Central Contractor Registration (MAY 1999)
- 52.233-1 - Disputes (DEC 1998)
- 52.233-3 - Protest After Award (AUG 1996)
- 52.242-13 - Bankruptcy (JUL 1995)
- 52.243-1 - Changes - Fixed Price (AUG 1987)
- 52.243-6 - Change Order Accounting (APR 1984)
- 52.245-9 - Use And Charges (APR 1984)(DEVIATION)
- 52.246-18 - Warranty Of Supplies Of A Complex Nature (MAR 2001)
- 52.246-24 - Limitation Of Liability - High-Value Items (FEB 1997)

- 52.247-63 - Preference For U.S.-Flag Air Carriers (JAN 1997)
- 52.247-64 - Preference For Privately Owned U.S. Flag Commercial Vessels (JUN 2000)
  
- 52.248-1 - Value Engineering (FEB 2000)
- 52.249-2 - Termination For Convenience Of The Government (Fixed Price) (SEP 1996)
- 52.249-8 - Default (Fixed-Price Supply And Service) (APR 1984)
  
- 52.251-1 - Government Supply Sources (APR 1984)
- 52.252-6 - Authorized Deviations In Clauses (APR 1984) fill in Defense Federal Acquisition Regulation Supplement (48 CFR Chapter 2);
- 52.253-1 - Computer Generated Forms (JAN 1991)

**DFARS CLAUSE    TITLE**

- 252.203-7001 - Prohibition On Persons Convicted Of Fraud Or Other Defense Contract Related Felonies (MAR 1999)
- 252.204-7000 - Disclosure Of Information (DEC 1991)
- 252.204-7002 - Payment For Subline Items Not Separately Priced (DEC 1991)
- 252.204-7003 - Control Of Government Personnel Work Product (APR 1992)
- 252.204-7004 - Required Central Contractor Registration (MAR 2000)
- 252.209-7000 - Acquisition From Subcontractors Subject To On-Site Inspection Under The Intermediate-Range Nuclear Forces (INF) Treaty (NOV 1995)
- 252.209-7004 - Subcontracting With Firms That Are Owned Or Controlled By The Government Of A Terrorist Country (MAR 1998)
- 252.223-7001 - Hazard Warning Labels (DEC 1991)
- 252.225-7001 - Buy American Act And Balance Of Payments Program (MAR 1998)
- 252.225-7002 - Qualifying Country Sources As Subcontractors (DEC 1991)
- 252.225-7007 - Buy American Act--Trade Agreements—Balance Of Payments Program (APR 2000)
- 252.225-7008 - Supplies To Be Accorded Duty-Free Entry
- 252.225-7009 - Duty-Free Entry - Qualifying Country Supplies (End Products And Components) (AUG 2000)
- 252.225-7010 - Duty-Free Entry - Additional Provisions (AUG 2000)
- 252.225-7012 - Preference For Certain Domestic Commodities (AUG 2000)
- 252.225-7025 - Restriction On Acquisition Of Forgings (JUN 1997)
- 252.225-7031 - Secondary Arab Boycott Of Israel (JUN 1992)
- 252.227-7000 - Non-Estoppel (OCT 1966)
- 252.227-7001 - Release Of Past Infringement (AUG 1984)
  
- 252.227-7013 - Rights In Technical Data--Noncommercial Items (NOV 1995)
- 252.227-7016 - Rights In Bid or Proposal Information (JUN 1995)
  
- 252.227-7030 - Technical Data--Withholding Of Payment (MAR 2000)
- 252.227-7034 - Patents--Subcontracts (APR 1984)
- 252.227-7036 - Certification Of Technical Data Conformity (JAN 1997)
- 252.227-7037 - Validation Of Restrictive Markings On Technical Data (SEP 1999)
- 252.227-7039 - Patents--Reporting of Subject Inventions (APR 1990)

- 252.231-7000 - Supplemental Cost Principles (DEC 1991)
- 252.233-7000 - Certification Of Claims And Requests For Adjustment Or Relief (MAY 1994)
- 252.242-7000 - Postaward Conference (DEC 1991)
- 252.242-7004 - Material Management And Accounting System (DEC 2000)
- 252.243-7001 - Pricing Of Contract Modifications (DEC 1991)
- 252.243-7002 - Requests For Equitable Adjustment (MAR 1998)
- 252.244-7000 - Subcontracts For Commercial Items And Commercial Components (DOD Contracts) (MAR 2000)
- 252.245-7001 - Reports Of Government Property (MAY 1994)
- 252.247-7023 - Transportation Of Supplies By Sea (MAR 2000)
- 252.247-7024 - Notification Of Transportation Of Supplies By Sea (MAR 2000) *(will be included if the successful offeror made a negative response to the inquiry at DFARS 252.247-7022)*
- 252.248-7000 - Preparation Of Value Engineering Change Proposals (MAY 1994)
- 252.251-7000 - Ordering From Government Supply Sources (MAY 1995)

**I-2 FAR 52.222-42 - STATEMENT OF EQUIVALENT RATES FOR FEDERAL HIRES (MAY 1989)**

In compliance with the Service Contract Act of 1965, as amended, and the regulations of the Secretary of Labor (29 CFR part 4), this clause identifies the classes of service employees expected to be employed under the contract and states the wages and fringe benefits payable to each if they were employed by the contracting agency subject to the provisions of 5 U.S.C. 5341 or 5332.

*THIS STATEMENT IS FOR INFORMATION ONLY: IT IS NOT A WAGE DETERMINATION*

Employee class	Monetary Wage - Fringe Benefits
_____	_____
_____	_____
_____	_____
_____	_____

**I-3 FAR 52.223-11 - OZONE-DEPLETING SUBSTANCES (MAR 2001)**

(a) *Definitions.* "Ozone-depleting substance", as used in this clause, means any substance the Environmental Protection Agency designates in 40 CFR Part 82 as –

- (1) Class I, including, but not limited to, chlorofluorocarbons, halons, carbon tetrachloride, and methyl chloroform; or
- (2) Class II, including, but not limited to, hydrochlorofluorocarbons.

(b) The Contractor shall label products which contain or are manufactured with ozone-depleting substances in the manner and to the extent required by 42 U.S.C. 7671j (b), (c), and (d) and 40 CFR Part 82, Subpart E, as follows:

WARNING

Contains (or manufactured with, if applicable) \_\_\_\_\_, a substance(s) which harm(s) public health and environment by destroying ozone in the upper atmosphere.

\*The Contractor shall insert the name of the substance(s).

**I-4 DFARS 252.225-7008 - SUPPLIES TO BE ACCORDED DUTY-FREE ENTRY (MAR 1998)**

In accordance with paragraph (b) of the Duty-Free Entry clause of this contract, in addition to duty-free entry for all qualifying country supplies (end products and components) and all eligible end products subject to applicable trade agreements (if this contract contains the Buy American Act - Trade Agreements - Balance of Payments Program clause or the Buy American Act - North American Free Trade Agreement Implementation Act - Balance of Payments Program clause ), the following foreign end products that are neither qualifying country end products nor eligible end products under a trade agreement, and the following nonqualifying country components, are accorded duty free entry.

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**PART III - LIST OF DOCUMENTS, EXHIBITS, AND OTHER ATTACHMENTS**  
**SECTION J**  
**LIST OF ATTACHMENTS**

- J-1** Attachment (1) - Specifications - Pages, with Exhibit A - DD Form 1423, Contract Data Requirements - Pages.
- J-2** Attachment (2) - Accounting and Appropriation Data. 1 page

**PART IV - REPRESENTATIONS AND INSTRUCTIONS  
SECTION K  
REPRESENTATIONS, CERTIFICATIONS  
AND OTHER STATEMENTS OF OFFERORS OR RESPONDENTS**

**K-1 Representations, Certifications, and Other Statements of Offerors or Respondents**

Each Offeror must submit a completed Representations, Certifications, and Other Statements Of Offerors or Respondents with its proposal which is available electronically in full text at <http://heron.nrl.navy.mil/contracts/rep&certs.htm>

**K-2 FILL IN FOR FAR 52.219-1 - SMALL BUSINESS PROGRAM REPRESENTATIONS (MAR 2001)**

The fill in information is as follows:

The NAICS code for this acquisition is: 334511

The small business size standard is:750 Employees

**SECTION L**  
**INSTRUCTIONS, CONDITIONS, AND NOTICES TO OFFERORS OR RESPONDENTS**

**L-1 52.252-1 SOLICITATION PROVISIONS INCORPORATED BY REFERENCE (FEB 1998)**

This solicitation incorporates one or more solicitation provisions by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. The offeror is cautioned that the listed provisions may include blocks that must be completed by the offeror and submitted with its quotation or offer. In lieu of submitting the full text of those provisions, the offeror may identify the provision by paragraph identifier and provide the appropriate information with its quotation or offer. Also, the full text of a solicitation provision may be accessed electronically at this/these address(es):

<http://www.arnet.gov/far>  
<http://heron.nrl.navy.mil/contracts/home.htm>

<b><u>FAR CLAUSE</u></b>	<b><u>TITLE</u></b>
52.204-6	- Data Universal Numbering System (DUNS) Number (JUNE 1999)
52.214-34	- Submission Of Offers In The English Language (APR 1991)
52.214-35	- Submission Of Offers In U.S. Currency (APR 1991)
52.215-1	- Instructions To Offerors- Competitive Acquisition (Mar 2001)
52.215-16	- Facilities Capital Cost Of Money (OCT 1997)
52.219-24	- Small Disadvantaged Business Participation Program - Targets (OCT 2000)
252.211-7005	- Substitutions For Military Or Federal Specifications And Standards (AUG 2000)

**L-2 FAR 52.211-14 - NOTICE OF PRIORITY RATING FOR NATIONAL DEFENSE USE (SEP 1990)**

Any contract awarded as a result of this solicitation will be a ☐ DX rated order; ☒ DO rated order certified for national use under the Defense Priorities and Allocations system (DPAS) (15 CFR 700), and the Contractor will be required to follow all of the requirements of this regulation.

**L-3 FAR 52.215-20 REQUIREMENTS FOR COST OR PRICING DATA OR INFORMATION OTHER THAN COST OR PRICING DATA (OCT 1997)ALTERNATE IV (OCT 1997)**

- (a) Submission of cost or pricing data is not required.
- (b) Provide information described below: Offerors should provide information to enable the Contracting Officer to determine that the proposed price is fair and reasonable. Such information could include published price lists, information on previous sales of the same or similar items, or the projected costs of fabricating and installing the item (material costs, labor costs, etc).

**L-4 FAR 52.216-1 - TYPE OF CONTRACT (APR 1984)**

The Government contemplates award of a Firm Fixed Price Supply contract resulting from this

solicitation.

**L-5 FAR 52.222-18 – CERTIFICATION REGARDING KNOWLEDGE OF CHILD LABOR FOR LISTED END PRODUCTS (FEB 2001)**

The fill-in information is as follows:

Listed End Product

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Listed Countries of Origin

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**L-6 FAR 52.233-2 - SERVICE OF PROTEST (AUG 1996)**

(a) Protests, as defined in Section 33.101 of the Federal Acquisition Regulation, that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO) shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgment of receipt from the Control Desk, Code 3200, Bldg. 222, Rm. 115, Naval Research Laboratory, 4555 Overlook Ave., S.W., Washington DC 20375-5326.

(b) The copy of any protest shall be received in the office designated above within one day of filing a protest with the GAO.

**L-7 DFARS 252.227-7017 - IDENTIFICATION AND ASSERTION OF USE, RELEASE, OR DISCLOSURE RESTRICTIONS (JUN 1995)**

- (a) The terms used in this provision are defined in following clause or clauses contained in this solicitation--
- (1) If a successful offeror will be required to deliver technical data, the Rights in Technical Data--Noncommercial Items clause, or, if this solicitation contemplates a contract under the Small Business Innovative Research Program, the Rights in Noncommercial Technical Data and Computer Software--Small Business Innovative Research (SBIR) Program clause.
  - (2) If a successful offeror will not be required to deliver technical data, the Rights in Noncommercial Computer Software and Noncommercial Computer Software Documentation clause, or, if this solicitation contemplates a contract under the Small Business Innovative Research Program, the Rights in Noncommercial Technical Data and Computer Software--Small Business Innovative Research (SBIR) Program clause.
- (b) The identification and assertion requirements in this provision apply only to technical data, including computer software documents, or computer software to be delivered with other than unlimited rights. For contracts to be awarded under the Small Business Innovative Research Program, the notification requirements do not apply to technical data or computer software that will be generated under the resulting contract. Notification and identification is not required for restrictions based solely on copyright.
- (c) Offers submitted in response to this solicitation shall identify, to the extent known at the time an offer is submitted to the Government, the technical data or computer software that the Offeror, its subcontractors



or suppliers, or potential subcontractors or suppliers, assert should be furnished to the Government with restrictions on use, release, or disclosure.

- (d) The Offeror's assertions, including the assertions of its subcontractors or suppliers or potential subcontractors or suppliers shall be submitted as an attachment to its offer in the following format, dated and signed by an official authorized to contractually obligate the Offeror:
- Identification and Assertion of Restrictions on the Government's Use, Release, or Disclosure of Technical Data or Computer Software.
- The Offeror asserts for itself, or the persons identified below, that the Government's rights to use, release, or disclose the following technical data or computer software should be restricted:

Technical Data or Computer Software to be Furnished With Restrictions*	Basis for Assertion**	Asserted Rights Category***	Name of Person Asserting Restrictions****
(LIST)*****.	(LIST)	(LIST)	(LIST)

\* For technical data (other than computer software documentation) pertaining to items, components, or processes developed at private expense, identify both the deliverable technical data and each such items, component, or process. For computer software or computer software documentation identify the software or documentation.

\*\* Generally, development at private expense, either exclusively or partially, is the only basis for asserting restrictions. For technical data, other than computer software documentation, development refers to development of the item, component, or process to which the data pertain. The Government's rights in computer software documentation generally may not be restricted. For computer software, development refers to the software. Indicate whether development was accomplished exclusively or partially at private expense. If development was not accomplished at private expense, or for computer software documentation, enter the specific basis for asserting restrictions.

\*\*\* Enter asserted rights category (e.g., government purpose license rights from a prior contract, rights in SBIR data generated under another contract, limited, restricted, or government purpose rights under this or a prior contract, or specially negotiated licenses).

\*\*\*\* Corporation, individual, or other person, as appropriate.

\*\*\*\*\* Enter "none" when all data or software will be submitted without restrictions.

Date

Printed Name and Title

Signature

(End of identification and assertion)

- (e) An offeror's failure to submit, complete, or sign the notification and identification required by paragraph (d) of this provision with its offer may render the offer ineligible for award.
- (f) If the Offeror is awarded a contract, the assertions identified in paragraph (d) of this provision shall be listed in an attachment to that contract. Upon request by the Contracting Officer, the Offeror shall provide sufficient information to enable the Contracting Officer to evaluate any listed assertion.

**L-8 INQUIRIES CONCERNING THE RFP**

Any questions concerning the RFP must be submitted in writing to the Contracting Officer at the location noted in blocks 7 and 9 of the Standard Form 33, "Solicitation, Offer and Award," no less than fifteen (15) days before closing. The Government will not consider questions received after this date. Offerors are cautioned against directing any questions concerning this RFP to technical personnel at the Naval Research Laboratory.

**L-9 INSTRUCTIONS FOR SUBMISSION AND INFORMATION REQUIRED TO EVALUATE PROPOSALS**

(1) Information for the technical/management proposal shall be placed in Volume I and be completely separate from the business proposal (Volume II).

(2) Proposal Identification/Mailing - The proposal should be packaged for delivery so as to permit safe and timely arrival at destination. The proposal package should be sent to the address shown in Block 7 of the RFP face page and marked:

**Solicitation No. N00173-01-R-RS02**

**Closing Date: (As specified in Block 9, RFP face page)**

**Attn: Code 3235:RDS**

(3) Proposal Format and Length - No attempt is made to restrict the proposal format and style. However, the proposal should be written and organized so as to be compatible with the RFP. Offerors are encouraged to use recycled paper and maximize the use of double sided copying when preparing responses to solicitations.

**L-10 VOLUME I - TECHNICAL/MANAGEMENT PROPOSAL**

**REQUIRED COPIES: 1 ORIGINAL AND 4 COPIES OF THE TECHNICAL PROPOSAL**

**L.10.A GENERAL PROPOSAL CONTENT:**

(i) It is the Government's intent insofar as possible to meet the design and performance specifications set forth in Attachment 1 hereto with commercial-off-the-shelf (COTS) equipment or COTS as modified to meet the specifications.

(ii) The Offeror is required to furnish an original and seven copies of a detailed TECHNICAL PROPOSAL with sufficient detail to clearly demonstrate compliance with the requirements stated in Section C and Attachment 1 of this solicitation.

(iii) The Technical Proposal shall be subdivided into a "Proposal Summary" section, a "Conformance with Technical Description" section, a "Capabilities and Corporate Resources" section, a "Program/Management Plan" section, and a "Corporate Past Performance" section in that order. All cost and pricing details shall be omitted from the Technical Proposal. .

(iv) The Technical Proposal shall contain responses to each of the individual requirements listed in Sections 3.0 through 6.73 of Attachment 1. Each response shall furnish the Government with sufficient detail to enable independent technical evaluation of each response against the respective Government requirement.

**L.10.B SPECIFIC REQUIREMENTS:**

**L.10.B.1 Proposal Summary**

The proposal summary is an unevaluated requirement. The Offeror shall provide a concise summary, exclusive of cost information, of its proposal. This summary should be complete, stand on its own, and provide executive level reviewers with an understanding of the content of the proposal. The summary should summarize the highlights, responses, plans and qualification contained in the body of the technical proposal.

**L.10.B.2 Conformance with Technical Description**

The Offeror shall discuss in detail its proposed technical approach to accomplishment of those requirements listed in Section C and Attachment 1 of this solicitation, which will lead to delivery of the required Full-Sky Astrometric Mapping Explorer Inertial Measurement Units. This discussion shall be in sufficient detail to (a) demonstrate the Offeror's compliance with the requirements specified in Section C and Attachment 1 of this solicitation; (b) demonstrate the Offeror's technical competence and understanding of the purpose, objectives and scope of the required work; (c) demonstrate the Offeror's understanding of the specific technical issues dealt with in Section C and Attachment 1; (d) present the Offeror's proposed procedures and solutions to address the requirements in Section C and Attachment 1; (e) provide a detailed description of the final deliverable; and (f) address all other pertinent technical issues.

It is the Government's intent insofar as possible to meet the design and performance specifications set forth in Attachment 1 hereto with commercial-off-the-shelf (COTS) equipment or COTS as modified to meet the specifications. Given this, the Offeror shall address: (a) the development and qualification status of the hardware, (b) technical compliance with the specifications incorporated in Section C and Attachment 1 of this solicitation; (c) perceived and inherent technical risk; (d) supporting analyses, which may include, but not be limited to, worst case, electrical stress, worst case timing, reliability, failure modes and effects criticality, and radiation analyses; (e) drawings, plans, schematics, parts lists, designs, charts, tables or other descriptive materials necessary to show both that the offeror's hardware is capable of meeting the requirements of this solicitation and that the design will be based on an existing commercial measurement unit.

**L.10.B.3 Capabilities and Corporate Resources**

The Offeror shall describe and document those resources that the firm will make available to this project, including, but not limited to: (a) financial resources, (b) personnel resources, especially those personnel whose education, experience and other qualifications uniquely qualify them for this project; (c) development, production and testing facilities and equipment; (d) major suppliers developed; and (e) any other technical resources offered to meet the Government requirements as stated in Section C and Attachment 1. The Offeror shall provide a brief history of its firm, with emphasis on the company's experience in producing hardware for similar requirements.

**L.10.B.4 Program/Management Plan**

Pursuant to this requirement, the Offeror shall provide a Program/Management Plan to demonstrate its capability to efficiently, effectively and economically plan, organize, coordinate and control the efforts required under this solicitation. The Offeror's Program/Management Plan shall provide detailed information regarding the Offeror's proposed schedule, manufacturing plan, and quality assurance plan. The Offeror's Program/Management Plan shall also address the firm's proposed internal procedures for meeting milestones and assuring timely delivery of the requirements stated within this solicitation.

**L.10.B.5 Corporate Past Performance**

(a) Offerors shall submit the following information as part of their proposal. (Offerors are encouraged to submit the information prior to other parts of the proposal to assist the government in reducing the length of the evaluation period.) List the last contracts or subcontracts completed by the offeror or predecessor companies during the past years for services similar in nature to this requirement. Include in the any current contracts or subcontracts for similar services that were awarded at least one year prior to the date of this solicitation. Offerors that have no similar previous or current contracts should provide the requested information for proposed subcontractors that will perform major or critical aspects of the requirement or for the proposed project manager or key personnel responsible for major or critical aspects of the requirement.

1. Name of contracting organization.
2. Contract number
3. Contract type
4. Total contract value
5. Description of the contract work
6. Contracting officer and telephone number
7. Contracting officer's representative, program manager, or similar official and telephone number

(b) Offerors shall contact the contracting organizations identified pursuant to paragraph (a) as soon as possible and request them to send past performance information on the identified contracts to the address in Block 7 of the face page of this solicitation. The past performance report which is available electronically in full text at <http://heron.nrl.navy.mil/contracts/home.htm> is to be provided to the contracting organization for this purpose. If the contracting organization has already collected past performance information on the contract pursuant to FAR Subpart 42.15, the format used to collect the information may be used instead of the past performance report.

(c) Offerors may include in their proposals specific information relating to problems encountered in performing the identified contracts and any corrective actions by the offeror. Offerors should not provide general information on their performance on the identified contracts as this will be obtained from the contracting organizations.

**VOLUME II - BUSINESS PROPOSAL**

L.10.C        REQUIRED COPIES: 1 ORIGINAL AND 2 COPIES

L.10.C.1      PRICE PROPOSAL

The offeror shall submit a business proposal that includes a price proposal with supporting information . The supporting information shall include copies of list or catalogue pricing offered to the general or a detailed breakdown including such elements as materials, direct labor, indirect expenses and any other costs associated with production, testing and delivery of the final hardware deliverables.

**L-11    MULTIPLE AWARDS**

The Government may make multiple awards resulting from this solicitation.

**SECTION M**  
**EVALUATION FACTORS FOR AWARD**

**M-1 EVALUATION**

Award will be made to that responsible offeror whose proposal is determined to be the best value to the Government, proposed cost and other factors considered. The Government reserves the right to make award to other than the low-priced offeror. Although technical considerations are more important than cost/price, the closer the technical scores between the various proposals are, the more important cost/price considerations become.

**M-2 EVALUATION FACTORS FOR AWARD**

Proposals in response to this solicitation will be evaluated in accordance with the criteria stated in Sections L.10.B.2, L.10.B.3, L.10.B.4, and L.10.B.5, which together comprise the Technical Category; and Section L.10.C.1 and L.10.C.2, which comprises the Business Category.

**M-2-1. TECHNICAL CATEGORY**

The Technical evaluation will consider the Offeror's overall approach to, understanding of, and capability to adequately perform the tasks and provide the requirements listed in Section C and Attachment 1, as reflected in the Offeror's responses to the evaluation criteria listed in Sections L.10.B.2, L.10.B.3, L.10.B.4, and L.10.B.5. Technical scores will be based on evaluative determinations of whether the Offeror's proposal meets, does not meet, or, as proposed, is more advantageous than the Government's minimum requirements. Pursuant to FAR 15.306(c), proposals which are found to contain unrealistic technical or schedule terms, which fail to comply with the requirements stated in this RFP, or which are found to be unrealistically high or low in cost/price, may be significantly downgraded or removed from consideration. Areas within the Offeror's technical proposal that are found to offer unique or innovative technical solutions or efforts beyond the Government's anticipation as stated in Attachment 1 may receive maximum technical scores.

Evaluated Components within the Technical Category include "Conformance with Technical Description", "Capabilities and Corporate Resources", "Program/Management Plan", and "Corporate Past Performance". Within the Technical Category, the component "Conformance with Technical Description" is weighted significantly higher than the equally-weighted components "Capabilities and Corporate Resources" and "Program/Management Plan", both of which are rated higher than "Corporate Past Performance".

Corporate Past Performance - Past performance will be evaluated on the basis of the quality of the work performed or supplies delivered and timeliness of performance or delivery. The evaluation will be based on the information provided pursuant to Section L and other sources if available. The evaluation will take into account past performance information regarding predecessor companies, subcontractors that will perform major or critical aspects of the requirement, or the proposed project manager or key personnel responsible for major or critical aspects of the requirement. Offerors that have no relevant performance history or for which past performance information is not available will not be evaluated favorably or unfavorably on past performance. The government may begin proposal evaluation prior to receipt of past performance information. If, after completion of proposal evaluation except evaluation of past performance, the contracting officer determines that

evaluation of past performance will not affect the outcome of competitive selection, the contracting officer may waive its evaluation in accordance with FAR 15.304(c)(3)(iii).

**M-2-2 PRICE TO THE GOVERNMENT**

Proposed estimated price to the Government.

**M-2-3 SMALL BUSINESS PARTICIPATION**

- (a) The extent of participation of small businesses and historically black colleges or universities and minority institutions in performance of the contract will be evaluated on the basis of the proposed extent of participation of such firms in terms of the value of the total acquisition and the complexity and variety of the work such firms are to perform.
- (b) The extent of participation of small disadvantaged business concerns in performance of the contract will be evaluated on the basis of the proposed extent of participation of such firms in terms of the value of the total acquisition and the complexity and variety of the work such firms are to perform.

**M-3 AWARD BY FULL QUANTITY**

An offeror must propose on all items in this solicitation to be eligible for award. Award will be made to that responsible offeror proposing the lowest total price for all items.

# NAVAL RESEARCH LABORATORY NAVAL CENTER FOR SPACE TECHNOLOGY

Inertial Measurement Unit (IMU) Specification  
for the

Full-sky Astrometric Mapping Explorer (FAME)

**NCST-S-FM007**

**30 May 2001**



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## 1.0 SCOPE

### .1 Identification

This specification establishes the top level functional performance, design, manufacture, verification, and acceptance requirements for the Full-sky Astrometric Mapping Explorer (FAME) Inertial Measurement Unit (IMU).

#### .1.1 Flight Unit

The IMU Flight Unit shall meet all the requirements of this specification and shall be tested to the performance and acceptance environmental tests of section 4.0.

#### .1.2 Qualification Unit

The IMU Qualification Unit shall meet all the requirements of this specification and shall be tested to the performance and qualification environmental tests of 4.0.

#### .1.3 Engineering Development Unit

The Engineering Development Unit (EDU) shall meet the form, fit, and function of the Flight Unit. The EDU will be used to verify mechanical and electrical compatibility with FAME's mechanical and electrical systems. The EDU shall not be required to meet the environmental requirements called out in this specification.

### .2 Purpose

This specification establishes the performance, design, manufacture, verification, and acceptance requirements for the FAME IMU.

### .3 Document Overview

This document is organized as follows:

- a. Section 1.0, *Scope*: Purpose and contents of this document.
- b. Section 2.0, *Referenced Documents*: A list of documents referenced in or required for use with this document.
- c. Section 3.0, *Requirements*:
  1. Paragraph 3.1 provides a comprehensive definition of the IMU.
  2. Paragraph 3.2 specifies the performance and physical characteristics of the IMU.
  3. Paragraph 3.3 specifies the minimum design and construction requirements for the IMU.
  4. Paragraph 3.4 describes the documentation that the Contractor must provide with the IMU.
- a. Section 4.0, *Quality Assurance Provisions*: Details the tests to be conducted and the methods of test verification that will be employed.
- b. Section 5.0, *Preparation for Delivery*: Provides guidance for preparing the IMU for delivery.
- c. Section 6.0, *Deliverables and Tasks*, describes the deliverable data that the Contractor must furnish with the IMU.
- d. Section 7.0, *Notes*: Provides additional information that is not contractually binding. Included are a glossary and list of acronyms.

The performance requirements herein are applicable during nominal operations, maintenance, or contingency events. Requirements for earlier or other staged events are noted. Each requirement, unless otherwise noted, represents the required performance of the IMU from the time of its activation through end of mission life.



## 2.0 APPLICABLE DOCUMENTS

### .1 Government Documents

The following documents of the exact issue shown form a part of this document to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement. Copies of specifications, standards, drawings, and publications required by Contractors in connection with specified procurement functions should be obtained from the contracting agency or as directed by the contracting officer. Documents beginning with the control number "SSD" and "NCST" are program documents controlled by the Naval Research Laboratory (NRL).

#### .1.1 Military Specifications

Most active military specifications are available on-line from: <http://astimage.daps.dla.mil/quicksearch/>

Number	Title	Paragraph Reference
MIL-DTL-31000A	Technical Data Packages	3.0.4.2
MIL-PRF-38534D	Hybrid Microcircuits, General Specification for	3.0.3.1.1.2
MIL-PRF-38535E	Integrated Circuits (Microcircuits) Manufacturing, General Specification for	3.0.3.1.1.2

#### .1.2 Military Standards

Most active military standards are available on-line from: <http://astimage.daps.dla.mil/quicksearch/>

Number	Title	Paragraph Reference
MIL-STD-1522B	Standard General Requirements for Safe Design and Operation of Pressurized Missile and Space Systems	3.0.3.1.2.2
MIL-STD-1686C	Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment	3.0.3.1.1.4
MIL-STD-461C	Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference	3.0.3.2.1, 3.0.3.2.2, 3.0.3.2.3.1
MIL-STD-461D	Requirements for the Control of Electromagnetic Interference Emissions and Susceptibility	3.0.3.2.4.1
MIL-STD-462	Measurement of Electromagnetic Interference Characteristics	3.0.3.2.1, 3.0.3.2.2, 3.0.3.2.3.1
MIL-STD-883E	Test Methods and Procedures for Microelectronics	3.0.3.1.1.2
MIL-STD-961D	Specification Practices	3.0.4.1
MIL-STD-1629A	Procedure for Performing Failure Modes and Effects Criticality Analysis	3.0.2.3.2

#### .1.3 Military Handbooks

Most active military handbooks are available on-line from: <http://astimage.daps.dla.mil/quicksearch/>

Number	Title	Paragraph Reference
MIL-HDBK-217F	Reliability Prediction of Electronic Equipment	3.0.2.3.1
MIL-HDBK-1547A	Electronic Parts, Materials, & Processes for Space & Launch Vehicles	3.0.3.1.1.3

**.1.4 Other Publications**

Number	Title	Paragraph Reference
EWRR 127-1	Eastern and Western Range Regulation 127-1, Range Safety Requirements	3.0.3.1.2.2
GSFC 311-INST-001A	Instructions for EEE Parts Selection, Screening, and Qualification Available from: <a href="http://epims.gsfc.nasa.gov/ctre/parts/inst/prd.htm">http://epims.gsfc.nasa.gov/ctre/parts/inst/prd.htm</a>	3.0.3.1.1.1, 3.0.3.1.1.2
GSFC-410-MIDEX-001	MIDEX Assurance Guidelines	3.0.2.6.2.2.3, 3.0.3.1, 3.0.3.1.1.2
MSFC-SPEC-522B	Design Criteria for Controlling Stress Corrosion Cracking	3.0.3.1.2.2, 3.0.3.1.2.6
NASA-STD-2100-91	NASA Software Documentation Standard Available from: <a href="http://satc.gsfc.nasa.gov/assure/docstd.html">http://satc.gsfc.nasa.gov/assure/docstd.html</a>	3.0.4.1, 3.0.4.3
SP-R-0022	Vacuum Stability Requirements of Polymeric Material for Spacecraft Applications, Specifications for	3.0.3.1.2.1
SSD-D-IM007	ICM Worst Case Analysis	3.0.2.3.4, 3.0.3.1.1.3

**.1.5 NASA Technical Standards**

NASA Technical Standards are available on-line from: <http://www.hq.nasa.gov:80/office/codeq/doctree/qdoc.pdf>

Number	Title	Paragraph Reference
NASA-STD-8739.1	Workmanship Standard for Staking and Conformal Coating of Printed Wiring Boards and Electronic Assemblies	3.0.3.1.3.1
NASA-STD-8739.2	Workmanship Standard for Surface Mount Technology	3.0.3.1.3.1
NASA-STD-8739.3	Soldered Electrical Connections	3.0.3.1.3.1
NASA-STD-8739.4	Crimping, Interconnecting Cables, Harnesses, and Wiring	3.0.3.1, 3.0.3.1.3.1
NASA-STD-8739.7	Standard for Electrostatic Discharge Control (Excluding Electrically Initiated Explosive Devices)	3.0.3.1.1.4

**.1.6 FAME Project Documents**

Available to registered users at <http://team8200.nrl.navy.mil/>

Number	Title	Paragraph Reference
NCST-D-FM007	FAME Contamination Control Plan	3.0.2.6.1.1, 3.0.2.6.1.2, 3.0.2.6.1.3, 3.0.2.6.2.1
NCST-D-FM018	FAME EMI/EMC Control Plan	3.0.3.2

**.2 Non-Government Documents**

The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on the date of the invitation of bids or request for proposal shall apply. In the event of conflict between the documents referenced herein and the contents of this specification, this specification shall take precedence. Copies of specifications, standards, drawings, and publications required by Contractors in connection with specified procurement functions should be obtained from the contracting agency or as directed by the contracting officer.

**.2.1 Specifications**

Not applicable.

**.2.2 Standards**

Not applicable.

**.2.3 Other Publications**

Number	Title	Paragraph Reference
ANSI/J-STD-001	Requirements for Soldered Electrical and Electronic Assemblies	3.0.3.1.3.1
ANSI/J-STD-002	Solderability Tests for Component Leads, Terminations, Lugs, Terminals and Wires	3.0.3.1.3.1
ANSI/J-STD-003	Solderability Test Methods for Printed Wiring Boards	3.0.3.1.3.1
ANSI/J-STD-004	Requirements for Soldering Fluxes	3.0.3.1.3.1
ANSI/J-STD-005	Requirements for Soldering Pastes	3.0.3.1.3.1
ANSI/J-STD-006	Requirements for Electronic Grade Solder Alloys and Fluxed and Non-fluxed Solid Solders for Electronic Soldering Applications	3.0.3.1.3.1
EIA-625	Requirements for Handling Electrostatic Discharge Sensitive Devices	3.0.3.1.1.4
IEEE/EIA 12207.0	Standard for Information Technology - Software Life Cycle Processes	3.0.4.1, 3.0.4.3
IEEE/EIA 12207.1	Standard for Information Technology - Software Life Cycle Processes - Life Cycle Data	3.0.4.1, 3.0.4.3
IEEE/EIA 12207.2	Standard for Information Technology - Software Life Cycle Processes - Implementation Considerations	3.0.4.1, 3.0.4.3
IPC-A-600D	Acceptability of Printed Wiring Boards Available from: <a href="http://www.ipc.org">http://www.ipc.org</a>	3.0.3.1.3.1
IPC-D-275	Standard for PCB Design and Assembly Available from: <a href="http://www.ipc.org">http://www.ipc.org</a>	3.0.3.1.3.1
IPC-FC-250	Performance Specification for Single and Double-Sided Flexible Printed Boards Available from: <a href="http://www.ipc.org">http://www.ipc.org</a>	3.0.3.1.3.1
IPC-FC-250A-86	Specification for Single and Double-Sided Flexible Wiring Available from: <a href="http://www.ipc.org">http://www.ipc.org</a>	3.0.3.1.3.1

**.3 Order of Precedence**

In the event of a conflict between the text of this specification and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

### 3.0 REQUIREMENTS

This section specifies the functional, performance, interface, logistic, quality factor, and design requirements for the IMU. The terms used to define the scope and the extent of the system requirements herein are defined in Section 6.0.

#### .1 Item Definition

The item specified herein is the Inertial Measurement Unit (IMU), an element of the FAME attitude control system. The equipment described by the requirements of this section shall satisfy the requirements for examination, analysis, and tests as specified in section 4.0. The IMU shall perform the functions of inertial angular rate measurement (or incremental angular measurement) and inertial acceleration (or incremental velocity measurement) in three mutually orthogonal axes. The IMU provides three-axis rate sensing and three-axis acceleration sensing capability and interfaces to the FAME spacecraft controller (FSC). The IMU will be used to determine vehicle attitude between star sensor updates. Any calibration and compensation required to meet performance requirements shall reside in the IMU. The IMU shall include the following components and characteristics. The IMU functional block diagram is shown in Figure 3-1.

- a. Gyroscope
- b. Accelerometer
- c. Output Data Interface(s)
- d. Power Conditioning

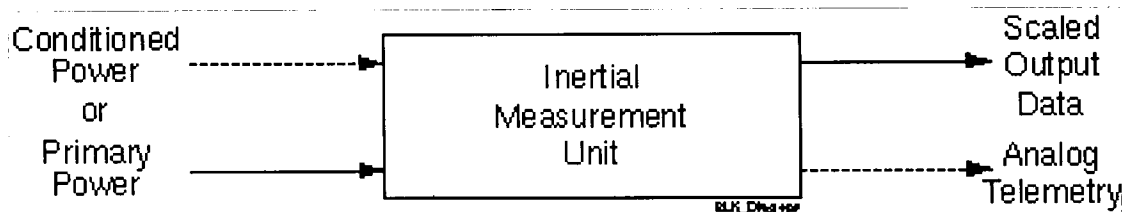


Figure 3-1. IMU Functional Block Diagram

#### .1.1 Interface Definition

The IMU will have the interfaces defined in the subsections below. Signal definitions are as follows:

Input and output signals will be active high unless otherwise specified. Active high signals are asserted at the higher (more positive) of two logic voltage levels (high-true). Active low signals are asserted at the lower (less positive) of two logic voltage levels (low-true). Active low signals will be identified by an asterisk (\*) after the signal name.

#### .2 Characteristics

##### .2.1 Performance Requirements

The IMU shall meet the performance requirements and shall provide the capabilities as specified within this document.

##### .2.1.1 Gyroscope Performance

###### .2.1.1.1 General

The IMU shall provide inertial angular rate indication about three mutually perpendicular axes.

###### .2.1.1.2 Maximum Continuous Input Rates

The unit shall be capable of maximum continuous input rates for each axis of 400 degrees/second.

###### .2.1.1.3 Output Scale Factors

The output scale factors for each axis shall be as defined below:

**.2.1.1.3.1 Scale Factor Linearity**

Scale factor linearity (after compensation) shall be less than 100 ppm (one sigma) per axis.

**.2.1.1.3.2 Scale Factor Stability**

Scale factor stability (after compensation) shall be less than 100 ppm (one sigma) per axis.

**.2.1.1.4 Bias Repeatability**

Bias repeatability shall not exceed 1 degree/hour (one sigma).

**.2.1.1.5 Angular Random Walk**

Angular random walk shall not exceed 0.15 degree/root-hour (one sigma) per axis.

**.2.1.1.6 Bandwidth**

The minimum bandwidth for each of the three gyroscope outputs shall be 30 Hz.

**.2.1.1.7 Axis Alignment**

The three gyroscope reference axes shall be mutually orthogonal. The physical misalignment of the gyroscope input axes relative to a set of optically derived axes shall not exceed 2 milliradians. The uncertainty in the alignment of the input axes relative to the optical reference axes shall be no greater than 100 microradians.

**.2.1.1.8 Sensitivity**

Each incremental angle measurement output shall have a maximum threshold of 10 degrees/hour.

**.2.1.1.9 Warm-up Time**

The warm-up time for the unit shall not exceed 1 minute.

**.2.1.2 Accelerometer Performance**

**.2.1.2.1 General**

The IMU shall provide inertial acceleration indication for three mutually perpendicular axes.

**.2.1.2.2 Maximum Continuous Acceleration**

The unit shall be capable of maximum continuous acceleration input for each axis of 30 g's.

**.2.1.2.3 Scale Factor Accuracy**

The output scale factor accuracy after compensation shall be less than 400 ppm (one sigma) per axis.

**.2.1.2.4 Bias Accuracy**

Bias accuracy shall not exceed 10 mg (one sigma).

**.2.1.2.5 Bandwidth**

The minimum bandwidth for each of the three accelerometer outputs shall be 40 Hz.

**.2.1.2.6 Axis Alignment**

The three gyroscope reference axes shall be mutually orthogonal. The physical misalignment of the gyroscope input axes relative to a set of optically derived axes shall not exceed 2 milliradians. The uncertainty in the alignment of the input axes relative to the optical reference axes shall be no greater than 500 microradians.

**.2.1.2.7 Least Significant Bit (LSB)**

The maximum LSB should be no greater than 0.003 ft/second.

**.2.1.2.8 Warm-up Time**

The warm-up time for the unit shall not exceed 1 minute.

**.2.1.3 Output Data Interfaces****.2.1.3.1 Output Data**

The Command, Telemetry, and Data Handling (CT&DH) System interfaces between the IMU and the FSC shall either be compatible with a RS-485 serial digital data bus or be MIL-STD-1553 compatible.

**.2.1.3.2 IMU Output Sampling Period**

The sample period of the IMU output shall be  $\pm 10$  milliseconds. Requirements of paragraph .2.1 shall be met using this sample period.

**.2.1.4 Primary Power**

The Contractor may choose one of two methods for primary power: a spacecraft-conditioned power source or the spacecraft's primary power. The Contractor shall provide specific power conditioning requirements for inclusion in this specification.

**.2.1.4.1 Conditioned Power (Alternate #1)**

The IMU may be powered from the spacecraft using a conditioned power source provided. Conditioned power can supply the following voltages:  $5 \pm 0.25$  Vdc,  $-5 \pm 0.25$  Vdc,  $+15 \pm 0.75$  Vdc, and  $-15 \pm 0.75$  Vdc. The combined power input to the IMU from all conditioned sources shall be less than 13 watts. Inrush currents shall be limited to twice the average operating input current.

**.2.1.4.2 Primary Power (Alternate #2)**

The IMU may be designed to accept unregulated input power from the FAME spacecraft bus Electrical Power System (EPS) and provide preregulation for use within the subsystem. Switching of input power (i.e., power-on and power-off) shall be accomplished in the EPS, which shall also provide control of inrush current. The equipment shall operate as specified herein when supplied with input power having the characteristics specified below, and shall not impose emissions on the power bus in excess of those specified herein.

**.2.1.4.2.1 Input Voltage**

The steady state voltage at the input connector of the equipment will be 24-36 Vdc, excluding noise, ripple and transients.

**.2.1.4.2.2 Source Impedance**

The input power will have an equivalent source impedance as depicted in Figure 3-2.

**.2.1.4.2.3 Isolation**

The equipment shall be compatible with a single-point ground for primary power with separate positive and return wires brought out to the power input connector. Primary input power and returns to the equipment shall be isolated from the case (chassis) and secondary power circuitry by a minimum dc resistance of one megohm. The case (chassis) or mounting structure shall not be used to conduct power currents.

**.2.1.4.2.4 Power Consumption**

The power consumption of the equipment shall not exceed 13 watts.

**.2.1.4.2.5 Inrush Current**

The inrush current to the equipment when switching from power-off to power-on in any mode shall not exceed twice the average operating input current, and the input current shall settle to within 10% of the nominal operating value within 200 milliseconds after the application of power. The input power equivalent circuit shall be as shown in Figure 3-2.

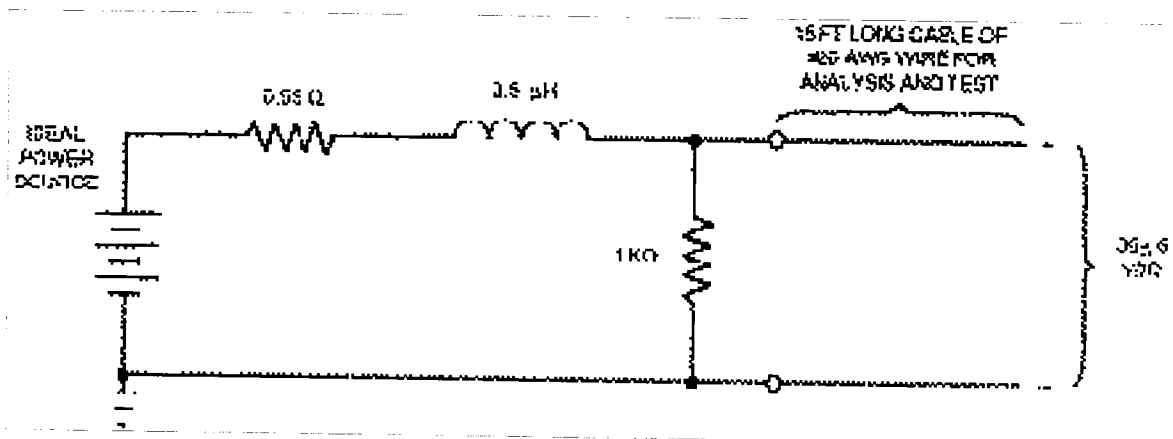


Figure 3-2. Primary Power Input Equivalent Circuit

## .2.2 Physical Characteristics

### .2.2.1 Mass Properties Control and Reporting

The mass properties of the IMU shall be reported and controlled.

#### .2.2.1.1 Weight Limits

The weight of the IMU shall not exceed the values listed in Table 3-1 and shall be included in the contractor provided ICD.

Table 3-1. IMU Weight Limits

Unit	Weight	Mass
IMU	8.8 lb	4 kg

#### .2.2.2 Dimensions and Envelope

Overall dimensions (including thermal effects and dynamic motion in the launch configuration) shall be reported and controlled in the contractor provided ICD.

#### .2.2.3 Coordinate System

Reference axes notation shall use the right-hand rule and be defined in the contractor provided ICD.

#### .2.2.4 Minimum Frequency

The stiffness of the IMU shall be such that it produces a fundamental frequencies above 50 Hz in all three axes hard-mounted at its interface.

#### .2.2.5 Center of Gravity (CG) Limits

The CG limits shall be defined in the contractor provided ICD.

## .2.3 System Quality Factors

### .2.3.1 Reliability

The contractor shall provide a reliability analysis on the IMU using the parts failure rates of MIL-HDBK-217. As a goal, the IMU design shall be such that a failure in one component does not propagate to other components. As a goal, the IMU shall, when practical, be capable of detecting malfunctions and automatically initiating protective measures to avoid loss of the mission.

**.2.3.2 Failure Modes, Effects, and Criticality Analysis**

A failure modes and effects criticality analysis shall be provided in accordance with MIL-STD-1629A.

**.2.3.3 Electrical Stress Analysis**

An electrical stress analysis shall be provided in accordance with SSD-D-IM007.

**.2.3.4 Worst Case Analysis**

A worst case analysis shall be provided in accordance with SSD-D-IM007.

**.2.3.5 Radiation Analysis**

A radiation analysis shall be provided to meet the requirements of paragraph .2.6.2.2.3.

**.2.4 Maintainability**

No scheduled and preventive maintenance shall be required to meet the performance requirements specified herein.

**.2.5 Fault Detection Capability**

As a goal, fault detection, isolation, and checkout capability shall be provided to the subassembly or component level. As a goal, on-orbit fault detection and isolation shall be provided to the component level.

**.2.6 Environmental Conditions**

The IMU shall be designed to operate within specification limits during and after exposure, as applicable, to all creditable combinations of operating and non-operating environments. The IMU shall be protected during ground handling and transportation so that the environmental conditions do not exceed flight or orbital conditions. These constraints shall not be interpreted as precluding environmental testing of the IMU. The following subparagraphs describe the general requirements for the environmental conditions that are applicable to the observatory space segment.

**.2.6.1 Non-Operating Environment**

The IMU shall meet the requirements of this document without refurbishment or adjustment after exposure to any combination of the environments specified herein for integration and test (I&T) facility (paragraph .2.6.1.1), ground handling and transportation (paragraph .2.6.1.2), and/or prelaunch (paragraph .2.6.1.3).

**.2.6.1.1 Integration and Test Facility Environment**

The IMU shall meet the requirements of this document without refurbishment or adjustment after exposure to any combination of the I&T environments listed below:

- a. *Ambient Air Temperature*: The ambient air temperature may vary from 7°C to 39°C.
- b. *Ambient Pressure*: Naturally occurring at sea level and at 5,000 feet.
- c. *Humidity*: The relative humidity may vary between 2% to 98%, non-condensing.
- d. *Acceleration, Vibration, Shock, and Loads*: Not applicable.
- e. *Cleanliness*: Flight hardware will be maintained in accordance with the requirements of NCST-D-FM007.

**.2.6.1.2 Ground Handling and Transportation**

The IMU shall meet the requirements of this document without refurbishment or adjustment after exposure to any combination of the ground handling and transportation environments listed below:

- a. *Ambient Air Temperature*: External environment is uncontrolled and will range from -25°C to +40°C.
- b. *Ambient Pressure*: Naturally occurring at sea level to 50,000 feet.



- c. *Humidity*: The relative humidity may vary between 2% to 98%, non-condensing. Internal shipping container environment controlled to prevent condensation of moisture or frost on flight hardware.
- d. *Acceleration, Vibration, Shock, and Loads*: The IMU shall not be exposed to environments greater than those experienced during launch and ascent.
- e. *Cleanliness*: Protective container or packaging to maintain flight hardware at the cleanliness level specified in NCST-D-FM007.

#### **.2.6.1.3 Prelaunch**

The IMU shall meet the requirements of this document without refurbishment or adjustment after exposure to any combination of prelaunch environments (environments that occur from arrival at the Expendable Launch Vehicle [ELV] launch site to launch) listed below:

- a. *Ambient Air Temperature*: Maintained from 7°C to 39°C.
- b. *Ambient Pressure*: Naturally occurring at sea level and at 5,000 feet.
- c. *Humidity*: Maintained between 2% and 98%. Appropriate measures will be implemented to prevent the formation of condensation on the observatory, test equipment, or protective covers.
- d. *Acceleration, Vibration, Shock, and Loads*: Observatory shall not be exposed to environments greater than those experienced during launch and ascent.
- e. *Cleanliness*: Assembly, test, and preparation area controlled to meet the environment specified in NCST-D-FM007.

#### **.2.6.2 Operating Environment**

The IMU shall be designed to perform as specified for 5 years after exposure to the environments specified herein for launch and ascent (paragraph .2.6.2.1) and on-orbit operations (paragraph .2.6.2.2).

##### **.2.6.2.1 Launch and Ascent**

The launch and ascent phase covers those environments that occur between terminal countdown and separation from the third stage. The IMU shall meet the requirements of this document without refurbishment or adjustment after exposure to the environments are listed below:

- a. *Temperature*: The temperature of the surrounding area and the baseplate will be maintained at any temperature between -20°C to +55°C.
- b. *Pressure*: The pressure decay curve in the launch vehicle fairing is defined in Figure 3-3. The IMU shall operate at pressures less than  $1 \times 10^{-5}$  torr.
- c. *Acceleration and Loads*: For design purposes, component accelerations are provided in Figure 3-4. The design factor of safety requirements for the quasi-static loads and the design limit load factors for the IMU are listed in Table 3-2.
- d. *Pyrotechnic Shock*: The IMU shall withstand the pyroshock environment as shown in Figure 3-5. The design factor of safety requirements for the quasi-static loads and the design limit load factors for the IMU are listed in Table 3-2. Pyrotechnique shock testing will be performed at the system level with the spacecraft.
- e. *Random Vibration*: The IMU shall withstand the random vibration environment as shown in Figure 3-6 and Figure 3-7.
- f. The design factor of safety requirements for the quasi-static loads and the design limit load factors for the IMU are listed in Table 3-2.
- g. *Cleanliness*: Assembly, test, and preparation area controlled to meet the environment specified in NCST-D-FM007.

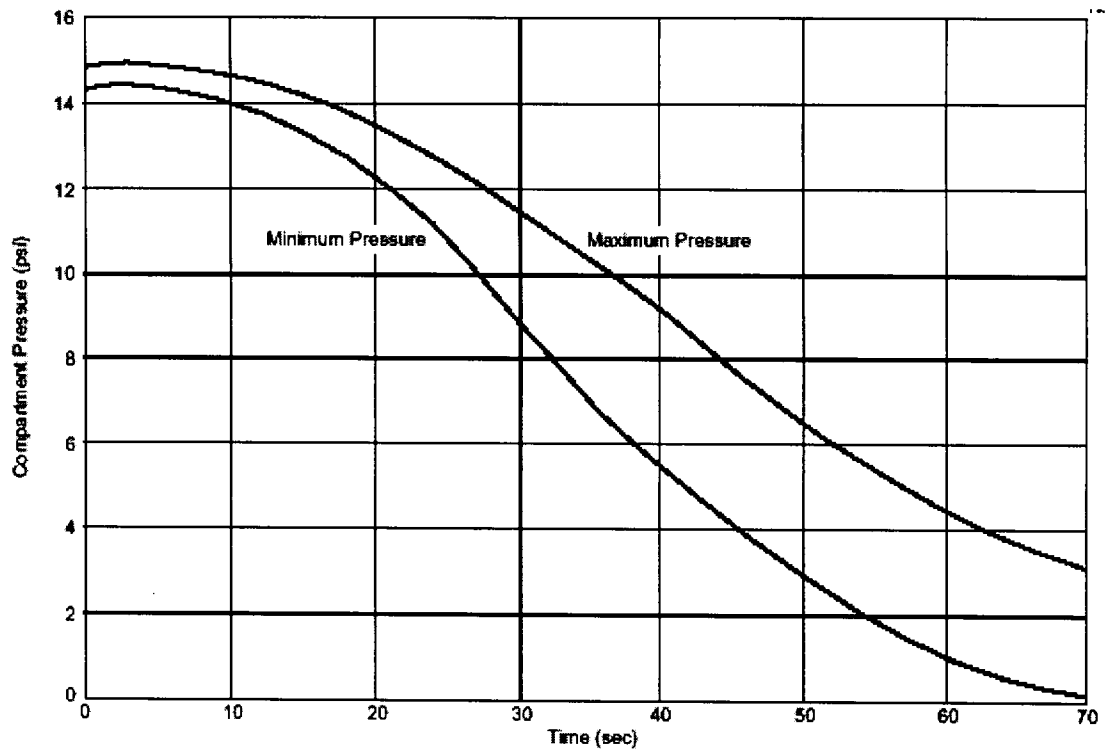
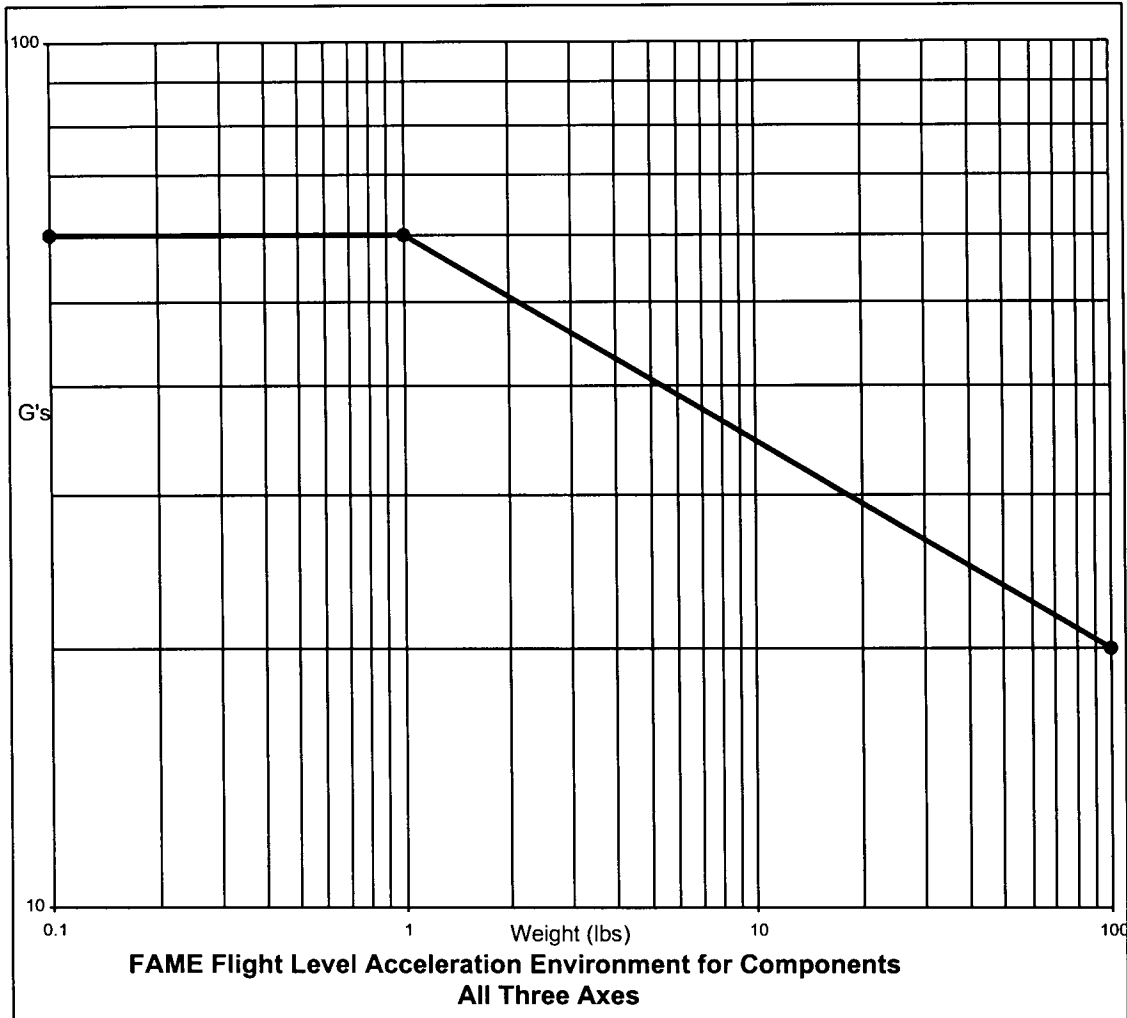


Figure 3-3. Pressure Decay Curve



Design Accelerations	
Component Wt. (Lbs)	G's
0.1	60
1	60
100	20

Design Acceleration Philosophy
<ul style="list-style-type: none"> <li>* These accelerations are to be used for component testing by sine burst or centrifuge,</li> <li>- Appropriate factors of safety shall be applied to these accelerations</li> <li>- For designated components, the acceleration level from this curve may also be used for vibration test tailoring</li> </ul>

Figure 3-4. Component Accelerations

Table 3-2. Quasi-Static Loads and Design Limit Load Factors

	With Test
Yield	1.10
Ultimate	1.40
Fatigue	4.00

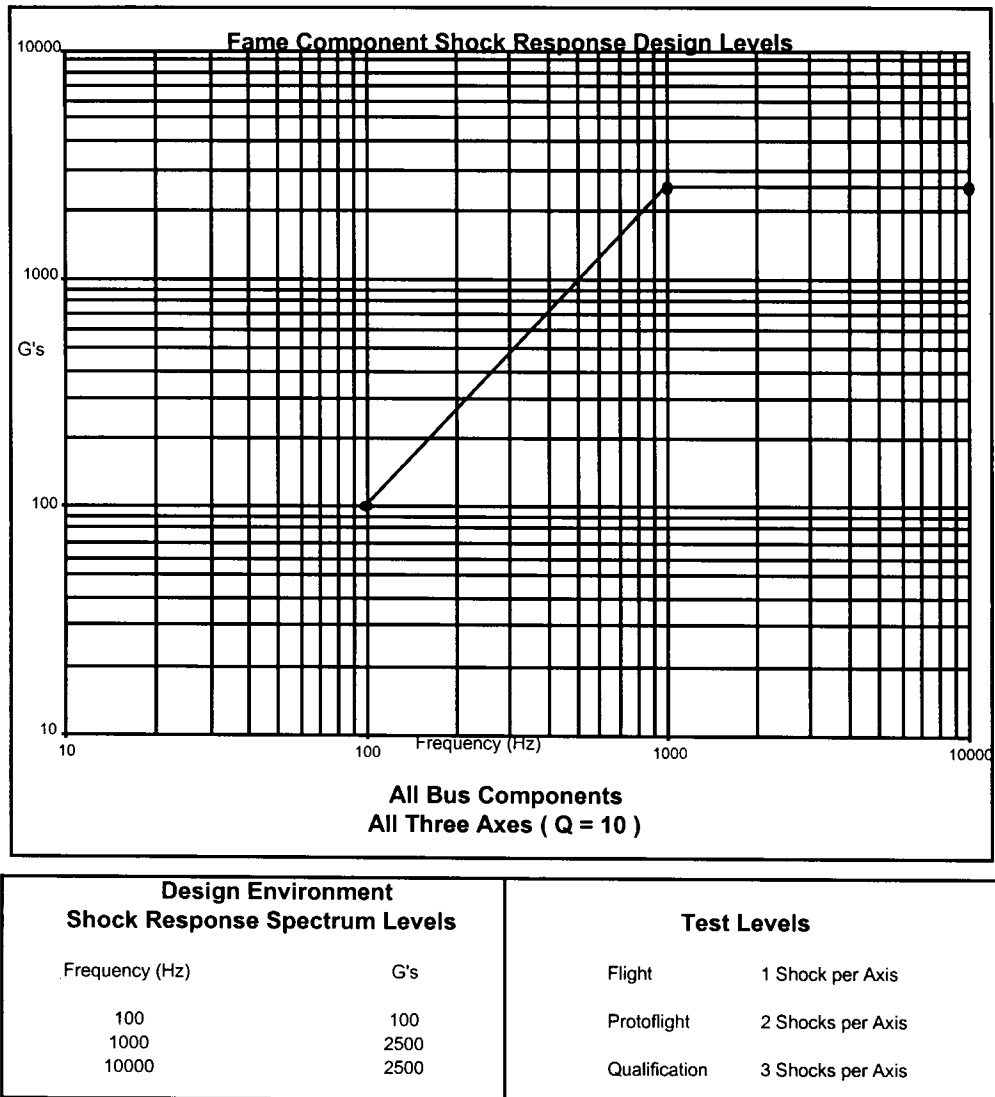
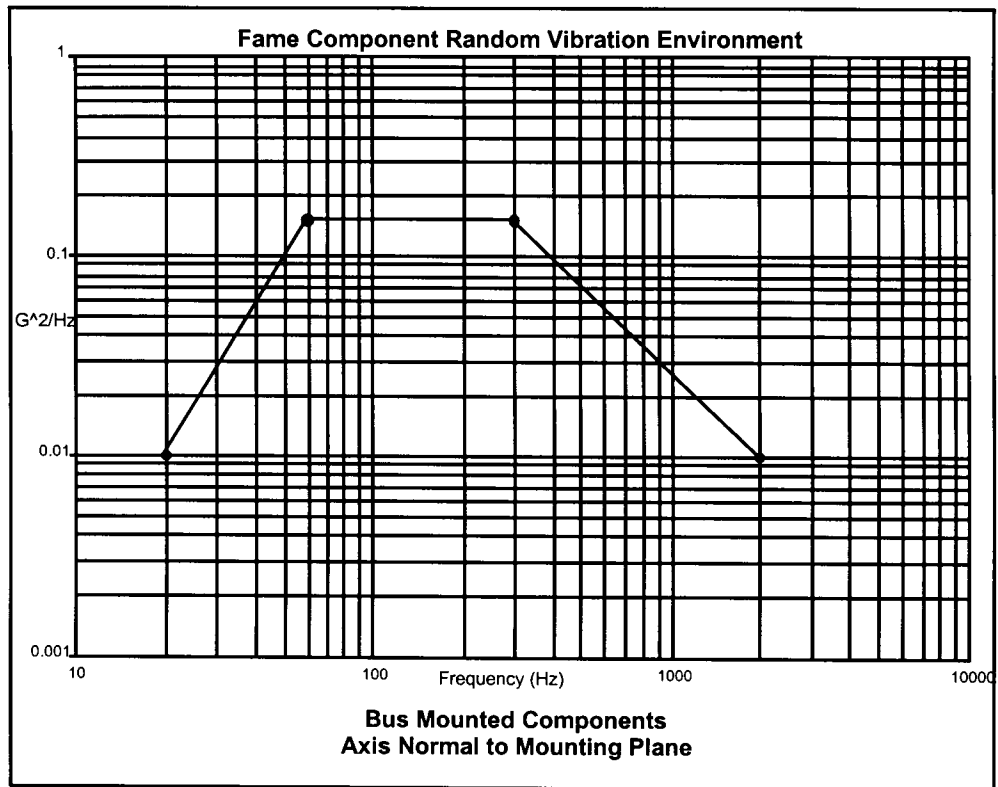


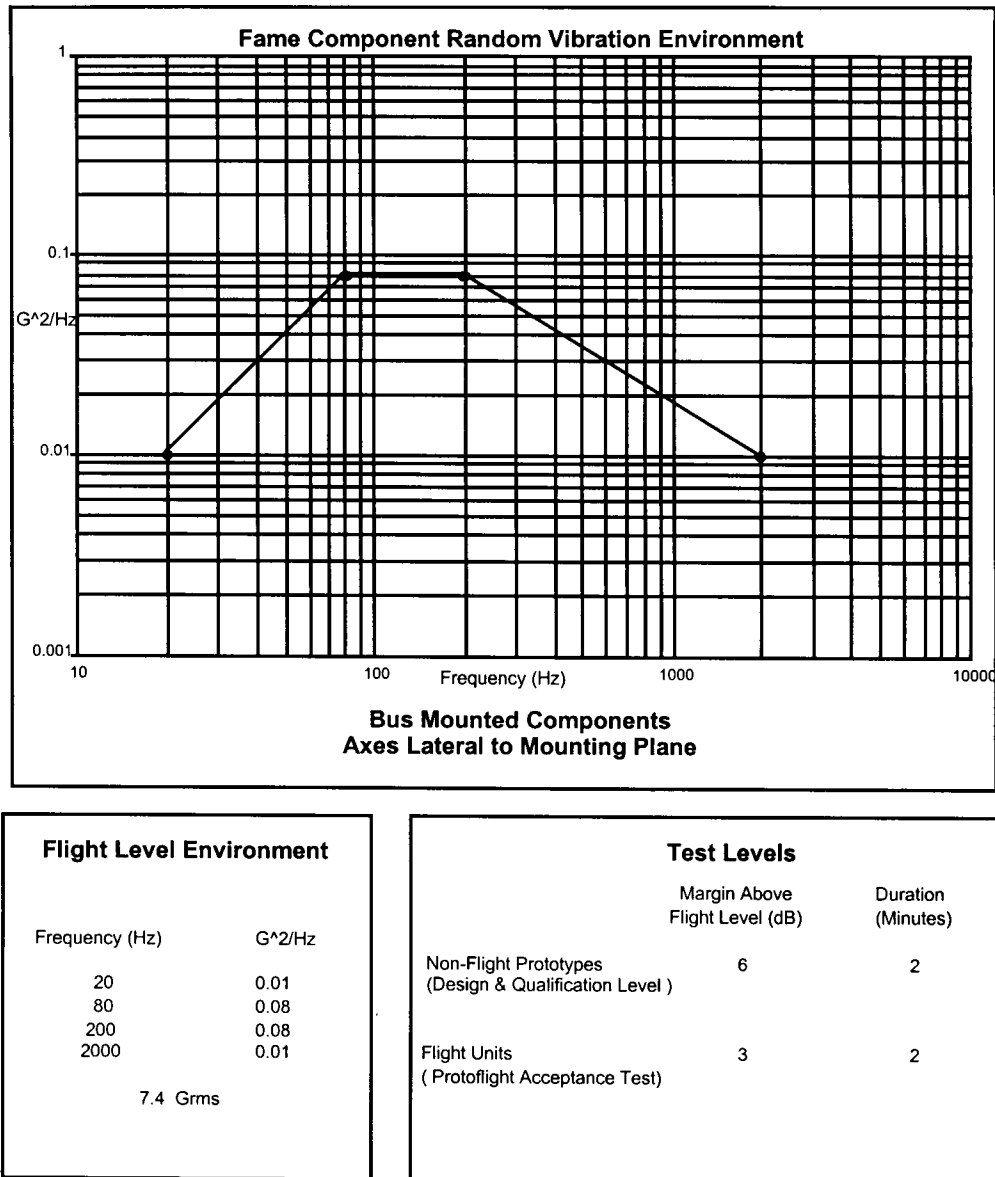
Figure 3-5. Pyroshock Environment



Flight Level Environment	
Frequency (Hz)	$G^2/Hz$
20	0.01
60	0.15
300	0.15
2000	0.01
9.9 Grms	

Test Levels		
	Margin Above Flight Level (dB)	Duration (Minutes)
Non-Flight Prototypes (Design & Qualification Level )	6	2
Flight Units ( Protoflight Acceptance Test)	3	2

**Figure 3-6. Random Vibration Environment, Axes Normal To Mounting Plane**



**Figure 3-7. Random Vibration Environment, Axes Lateral To Mounting Plane**

#### **.2.6.2.2 Orbital Operations**

The orbital operations phase covers those environments that occur when the observatory reaches geosynchronous altitudes. The IMU shall meet the requirements of this document without refurbishment or adjustment during exposure to any combination of the following environments:

##### **.2.6.2.2.1 Temperature**

The IMU baseplate temperature will be maintained to -20°C to +55°C.

##### **.2.6.2.2.2 Pressure**

The IMU shall meet the requirements of this document while operating in a hard vacuum of less than  $1 \times 10^{-5}$  torr.

**.2.6.2.2.3 Particle Radiation**

The FAME observatory will be subjected to galactic cosmic radiation, geomagnetically trapped particle radiation, and solar particle event (SPE) radiation (Table 3-3). It is imperative that mission critical electronics continue to operate within specifications until the end of the 5 year extended mission and during the worst case solar activity. Therefore, design requirements shall address Total Ionizing Dose (TID) and Single Event Effects (SEE) as required by paragraph 5.8 of GSFC-410-MIDEX-001. The anticipated 5 year observatory radiation environment is shown in Figure 3-8.

**Table 3-3. FAME Radiation Dose Estimates and Requirements for 5-Year Mission Duration Beginning in November 2004**

<b>Hemisphere Aluminum Shielding Thickness</b>	<b>Total Dose +0% Margin for 5 Year Mission</b>
<b>mils(Al)</b>	<b>rads(Si)</b>
0.5	4.68E+08
5.0	1.15E+08
10.0	5.25E+07
25.0	1.14E+07
50.0	2.47E+06
75.0	8.37E+05
100.0	3.36E+05
125.0	1.46E+05
150.0	6.66E+04
175.0	3.27E+04
200.0	1.82E+04
225.0	1.14E+04
250.0	7.79E+03
275.0	5.65E+03
300.0	4.35E+03
350.0	3.06E+03
400.0	2.56E+03
<p>Note 1. The <math>2\pi</math> hemispherical shielding assumes that substantial satellite structures attenuate the radiation environment in the other hemisphere (e.g. boxes near a surface). <math>4\pi</math> geometry may be a more appropriate where structures are deep within the satellite.</p> <p>Note 2. Spherical shielding is usually a conservative assumption, and refined dose estimates based on ray tracing sector analyses will lead to lower doses for box geometries of equal thickness.</p>	

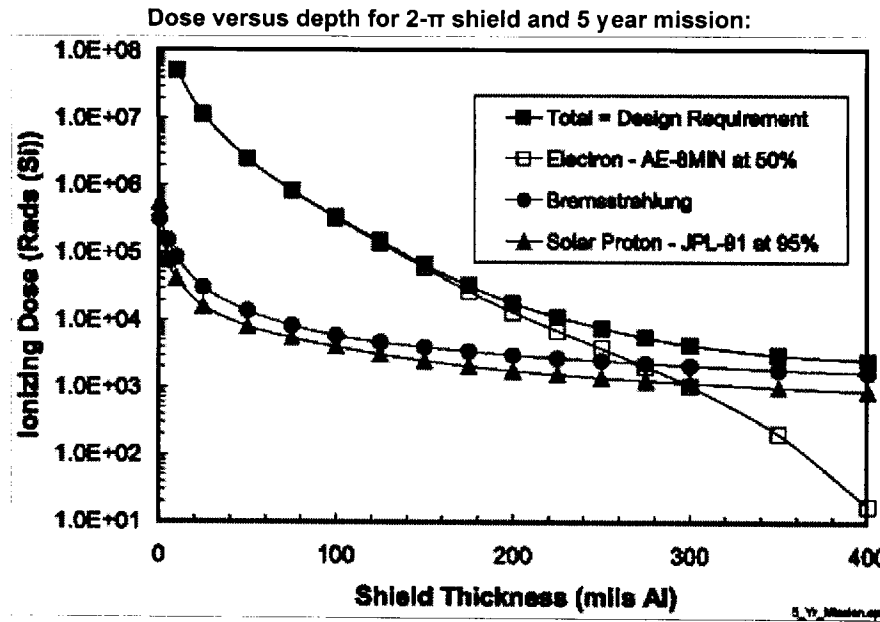


Figure 3-8. Observatory Radiation Environment

#### .2.6.2.2.3.1 Total Ionizing Dose

- Any part used in the observatory shall meet the requirements of this document at a minimum TID failure level of 18.2 krad(Si). This level is arrived at using the depth-dose relation of Figure 3-8 with an assumed hemispherical shield thickness of 200 mils Al. The minimum hardness level of 18.2 krad(Si) also includes a factor of 2 that is recommended for uncertainty in the environment.
- Any part that does not meet this minimum requirement of 18.2 krad(Si) shall be identified in the Preliminary Design Review (PDR).

#### .2.6.2.2.3.2 Single Event Effects

SEE shall be considered for the galactic cosmic ray environment and for the worst expected SPE.

- The galactic cosmic ray design environment for the nominal case of 200 mils Al shielding during solar minimum conditions is a Linear Energy Transfer of 35 MeV cm<sup>2</sup>/mg.
- The observatory will be subjected to occasional SPE producing high fluxes (>10<sup>5</sup> p/cm<sup>2</sup>/s) for short periods and with elevated levels for periods of up to several days. While the science mission may be interrupted during SPE, the events must not compromise the survival of the observatory or the completion of the science mission objectives.

#### .2.6.2.2.3.2.1 Single Event Induced Destructive Failure

- The IMU shall not be susceptible to single event induced failure (including latchup, burnout, gate rupture, and secondary breakdown) unless the Single Event Latchup (SEL) effects can be mitigated by design.
- Where single event failure cannot be ruled out the part shall be identified at PDR and its use, along with mitigation approach, justified.

#### .2.6.2.2.3.2.2 Single Event Induced Non-Destructive Failures

- The use of parts with these non-destructive failure modes may be allowed if analyses can show that they do not cause uncorrectable errors or affect system performance. Such parts shall be identified at PDR, along with failure effect and mitigation strategy (e.g., watchdog timer with autonomous power cycle or reset command).



**.2.6.2.3.2.3 Single Event Induced Soft Errors**

- a. Nondestructive SEE (including Single Event Upsets [SEU] or transients in linear devices) shall not cause IMU failure, compromise IMU health, or affect IMU performance.
- b. The use of parts with soft error modes may be allowed if analyses show that uncorrectable errors or effects to system performance do not occur. Such parts shall be identified at PDR/CDR, along with failure effect and mitigation strategy (e.g., Error Detection and Correction [EDAC] on memories or filters on linears).

**.2.6.2.2.4 Acceleration**

The accelerations experienced by the IMU during orbital operations will not exceed launch loads in any direction.

**.2.6.2.2.5 Pyrotechnic Shock**

The pyrotechnic shock environment experienced by the IMU during orbital operations will not exceed the launch and ascent environment.

**.2.6.2.2.6 Random Vibration**

The random vibration environment experienced by the IMU during orbital operations will not exceed the launch and ascent environment.

**.2.7 Transportability****.2.7.1 Packaging and Transportation**

Packaging shall be sufficient to ensure that the IMU is received in working condition and is free of damage or defects caused by transportation. If required, a packaging and transportation plan or procedure shall be developed. The plan shall address special handling requirements as applicable to the unit being delivered. Transportation of any explosive devices (i.e., ordnance) shall be in accordance with the requirements of the applicable carrier.

**.2.7.2 Marking**

Marking for shipment shall be appropriate for the mode of shipment.

**.3 Design and Construction**

The following paragraphs describe the general requirements for design and construction that are applicable to the IMU.

**.3.1 Parts, Materials, and Processes**

The Contractor shall implement a Parts, Materials, and Processes (PMP) in accordance with the guidelines contained in GSFC-410-MIDEX-001, paragraph 5.1, *Parts*, and paragraph 5.2, *Materials and Processes*.

- a. The radiation hardness characteristics of all EEE parts shall be established, implemented, and maintained. Resultant data shall be presented for review at the PDR and the Final Design Review (FDR).
- b. Interconnecting cables, harnesses, and wiring shall be selected in accordance with the guidelines of NASA-STD-8739.4.
- c. Electronic parts and materials that have been permanently installed in an assembly and which are then removed from an assembly for any reason shall not be used in any item of spaceflight hardware.

**.3.1.1 Parts****.3.1.1.1 EEE Standard Parts Selection Criteria**

The goal of the EEE parts program is to provide the highest reliability level available within the program and schedule limitations.

- a. The Contractor shall select standard EEE parts in accordance with GSFC 311-INST-001A with a quality level no lower than Level 2.
- b. All other parts selection shall be considered nonstandard and shall be presented for review at the PDR and FDR.

#### **.3.1.1.2 EEE Parts Procurement, Processing, and Screening**

The Contractor shall use the following guidelines for establishment of their parts program:

- a. EEE parts shall be procured and screened as specified herein, except that rescreening of JANTXV devices is not required, and requirements for a coordinated parts procurement do not apply. A parts control board is optional.
- b. Specific FAME program parts screening requirements are as follows:
  - 1. The parts program shall provide for a review of Government-Industry Data Exchange Program (GIDEP) alerts, notices, and advisories and provide notification to NRL on affected parts and assemblies.
  - 2. Microcircuits and semiconductors shall be subjected to radiographic (X-ray) inspection and Particle Impact Noise Detection (PIND) as appropriate to their construction.
  - 3. Parts screening guidelines shall be required for all nonstandard parts.
  - 4. Microcircuits per MIL-PRF-38534 or MIL-PRF-38535 are preferred. However, microcircuits that are fully compliant with paragraph 1.2.1 of MIL-STD-883 may be used with approval from the FAME Project Management Office (PMO). If a microcircuit is not a Qualified Parts List (QPL) class B part or purchased from a Qualified Manufacturer List (QML) vendor, then it shall be considered as nonstandard and subject to review at the PDR and FDR.
  - 5. The decision criteria to perform Destructive Physical Analysis (DPA) will be in accordance with the guidelines provided in GSFC 311-INST-001A for a quality level no lower than Level 2. Except as otherwise specified in paragraph 5.2 of GSFC-410-MIDEX-001, a DPA should not be required unless it is deemed necessary as indicated by failure history, GIDEP alert, or a parts control board.
  - 6. The parts program shall ensure that the results of receiving inspection, parts tests, material review boards, and parts problems reported from system testing are documented and periodically reviewed.

#### **.3.1.1.3 EEE Parts Stress Derating**

As part of the design process, the Contractor shall derate all EEE parts such that the applied stresses do not exceed the derating criteria guidelines of SSD-D-IM007 (as tailored for the FAME program) and MIL-HDBK-1547.

#### **.3.1.1.4 Electrostatic Discharge Sensitive EEE Parts**

- a. All electrical components using ESD parts shall provide adequate protection to preclude part failure resulting from handling, shipment, or storage situation.
- b. ESD protection shall be in accordance with approved processes and procedures that implement NASA-STD-8739.7, MIL-STD-1686, or EIA-625 guidelines.

### **.3.1.2 Materials**

#### **.3.1.2.1 Outgassing**

- a. Materials exhibiting total mass loss (TML) of 1.0% or less and collected volatile condensable material (CVCM) values of 0.1% or less shall be used in accordance with SP-R-0022.
- b. Any materials that fail to meet these criteria shall be identified to the FAME PMO.

#### **.3.1.2.2 Structural and Metallic Materials**

MSFC-SPEC-522 Table I materials are strongly preferred. MSFC-SPEC-522 Table II and Table III materials should receive careful consideration and shall be identified at the PDR and FDR.

- a. Metallic materials shall be corrosion resistant by nature or shall be corrosion inhibited by means of protective coatings.
- b. Base metals intended for intermetallic contact that form galvanic couples shall be plated with those metals that reduce the potential difference or shall be suitably insulated by a nonconducting finish.
- c. Electrical bonding methods shall include provisions for corrosion protection of mating surfaces. Use of dissimilar metals shall be avoided.
- d. Pressurized systems shall meet the requirements of MIL-STD-1522 and EWRR 127-1.

#### **.3.1.2.3 Magnetic Materials**

The residual dipole of the FAME space segment must be minimized and the use of magnetic materials should be avoided whenever possible. When magnetic materials must be used they shall be identified, along with the field intensity caused by the material, at the PDR and FDR.

#### **.3.1.2.4 Finishes**

- a. Cadmium and zinc coatings shall not be used.
- b. Pure tin coated components shall not be used within electronic boxes.

#### **.3.1.2.5 Toxic Products and Formulations**

Toxic products and formulations shall meet the applicable OSHA and launch site safety requirements.

#### **.3.1.2.6 Stress Corrosion**

Materials shall be selected to control stress corrosion cracking in accordance with MSFC-SPEC-522.

#### **.3.1.2.7 Polymer Materials**

Uralane 5750 (B/A) shall be used for conformal coating applications.

### **.3.1.3 Processes**

#### **.3.1.3.1 Soldering and Other Processes**

Soldering and other processes shall be specified in NRL-approved process specifications. NRL reserves the right to inspect and approve all process specifications.

- a. Special processes (e.g., adhesive bonding, plating, etc.) shall be in accordance with NRL-approved process specifications.
- b. Soldering of electrical connections shall be in accordance with ANSI/J-STD-001 (High Reliability Class) and the applicable associated standards ANSI/J-STD-002 through -006 or to process specifications that implement NASA-STD-8739.3 and NASA-STD-8739.4 guidelines.
- c. Crimping of electrical connections shall be in accordance with process specifications that implement NASA-STD-8739.4 guidelines.
- d. Conformal coating and staking of printed wiring boards and electronic assemblies shall be in accordance with process specifications that implement NASA-STD-8739.1 guidelines.
- e. Printed Circuit Boards (PCBs) used in the fabrication of the equipment shall conform to the requirements of IPC-D-275, IPC-FC-250, IPC-FC-250A-86, and IPC-A-600D (or their NRL-approved equivalents) or NASA-STD-8739.2.

#### **.3.1.3.2 Traceability Process**

The Contractor shall maintain a system for categorizing PMP and EEE parts into sets of homogeneous groups and tracing those parts through the fabrication, assembly, test, and delivery cycles.

- a. The IMU PMP shall be traceable from the initial vendor of part, material, or component through the completed hardware item.
- b. EEE parts shall be traced by part number, serial number (when available), and lot number.
  1. The Contractor shall maintain fabrication records (i.e., travelers) that provide two-way traceability from the first stages of assembly through final acceptance testing.
  2. Specific entries shall be made on the fabrication record as parts are installed.
  3. Traceability records shall be as shown in Table 3-4.

**Table 3-4. Traceability and Lot Control**

Part	Relevant Information
Electronic Piece Parts	Mfg/Date/Lot Code
Printed Circuit Boards	Serial Number
Potting/Adhesives/Coatings	Batch Number
Plating of Electronic Housings	Production/Manufacturer Lot Number
Modules and Assemblies	Serial Number
Connectors	Manufacturer Lot Number and Date Code
Chassis Case and Structures	Lot or Heat Treat Number

- a. All electronics piece parts installed shall be identified and documented in order to be traceable to a specific manufacturer, lot number, or date/lot code.
- b. The Contractor shall maintain coupons for all Printed Wiring Boards (PWBs) used in each final assembly. The coupons shall have traceability as defined in paragraph .3.1.3.2.a.

### **.3.1.3.3 Failure Reporting and Corrective Action System**

- a. The Contractor shall establish and maintain a closed loop failure reporting and corrective action system (FRACAS) for reporting, analysis, and corrective action of failures occurring during the acceptance testing phases and continuing until integration with the ELV.
- b. The FRACAS shall determine whether failures are caused by design deficiencies, human error, defective parts, infant mortality, test equipment, environmental exposure, or software.

## **.3.2 Electromagnetic Environment**

The IMU shall be designed and constructed such that each item is compatible with itself and with its known environments.

### **.3.2.1 Conducted Emission**

The IMU shall meet the conducted emissions levels defined in Figure 3-9 and Figure 3-10 for FAME. The requirements are modifications of the MIL-STD-461C limits. MIL-STD-462 test methods shall be used.

### **.3.2.2 Conducted Susceptibility**

The IMU shall not exhibit malfunctions, degradation of performance, or deviation from specification when subjected to the levels defined in Figure 3-11 for CS01 or 0.18 Vrms (0.5 Vp-p) from a 50 Ohm source for CS02 frequency range of 50 kHz to 400 MHz. The requirements are modifications of the MIL-STD-461C limits. MIL-STD-462 test methods shall be used.

### **.3.2.3 Radiated Emissions.**

The subsystem shall be designed to limit radiated emissions to the levels specified herein.

### .3.2.3.1 Narrowband Emissions

The apparent field strength of narrowband emissions at one meter from the IMU shall be limited to the values shown in Figure 3-12. The requirement is a modification of MIL-STD-461C Part 3, Curve #1. A notch was included for the frequency range of 2015 - 2130 MHz. MIL-STD-462 test methods shall be used.

### .3.2.3.2 Broadband Emissions

Not applicable.

### .3.2.4 Radiated Susceptibility

The IMU shall be designed to operate without malfunction, undesirable response, or deviation from specified performance tolerances when subjected to the radiated emissions specified herein.

#### .3.2.4.1 Narrowband Susceptibility

The IMU shall withstand a modified MIL-STD-461D RS103 level of 20 V/m, 1 kHz pulse modulation for frequencies from 10 kHz to 18 GHz, with a 40 V/m notch at 2200 to 2300 MHz. MIL-STD-462 test methods shall be used.

#### .3.2.4.2 Broadband Susceptibility

Not applicable.

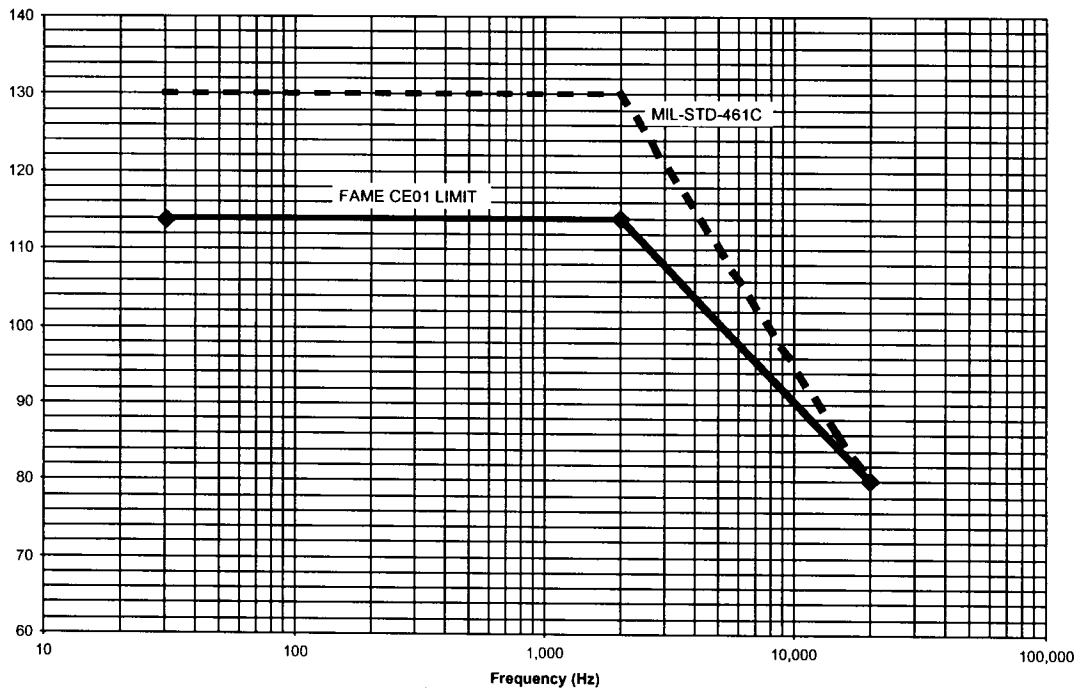


Figure 3-9. Limit for CE01 Narrowband Emissions

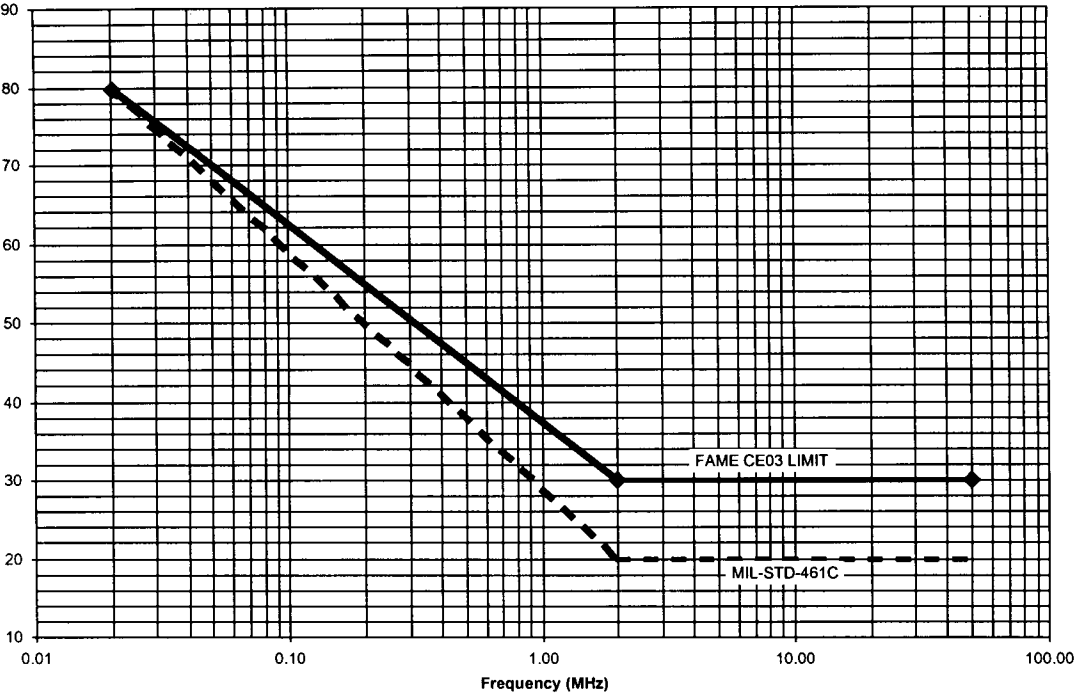


Figure 3-10. Limit for CE03 Narrowband Emissions

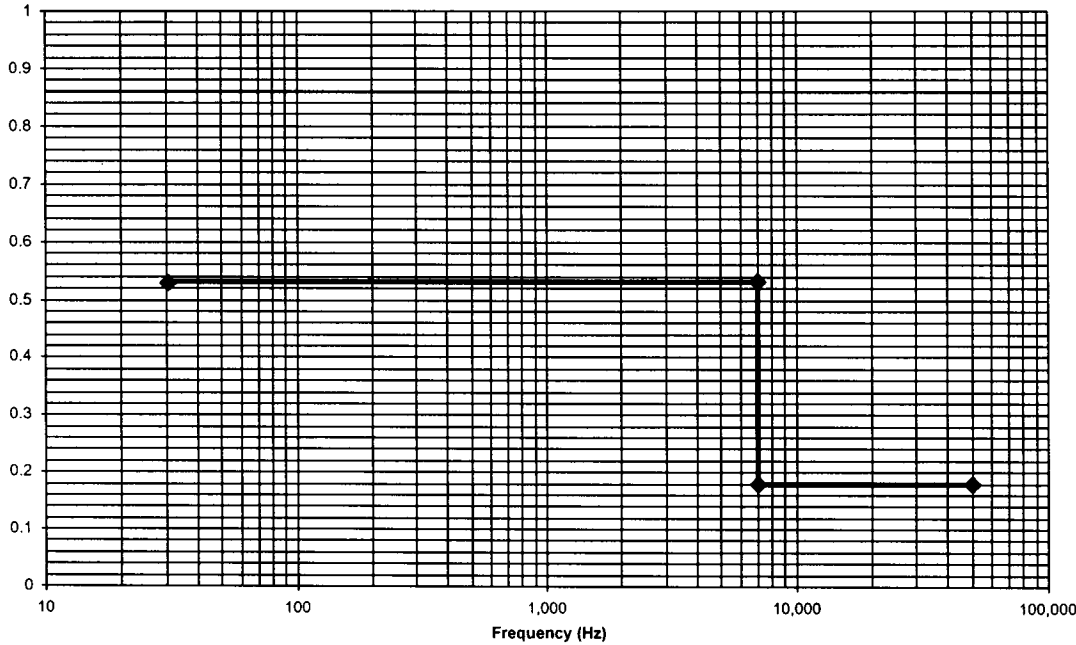
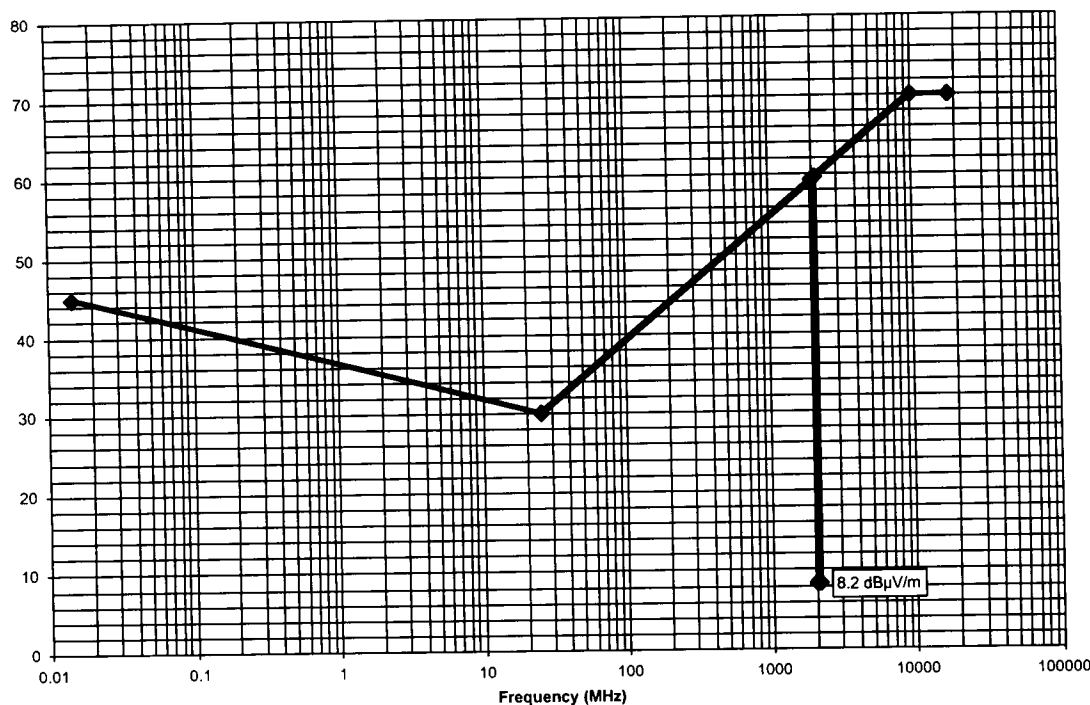


Figure 3-11. CS01 Voltage Injection Levels (30 Hz to 50 kHz)



**Figure 3-12. Limit for RE02 Narrowband Emissions (14 kHz to 18 GHz)**

### **.3.3 Corona Suppression**

The IMU shall be designed to minimize the occurrence of corona discharge in all normal operating environments.

### **.3.4 Nameplate and Product Marking**

IMU components that are interchangeable shall be identified by part number and serial number or lot number.

### **.3.5 Workmanship**

- a. All parts and assemblies shall be designed and manufactured in accordance with NRL-approved process specifications or drawings.
- b. All parts and assemblies shall be free of defects that would interfere with operational use, such as excessive scratches, nicks, burrs, loose material, contamination, and corrosion.
- c. Equipment shall be manufactured, processed, tested, and handled such that finished items are of sufficient quality to ensure reliable operation, safety, and service life in the operational environments.

### **.3.6 Interchangeability**

Assemblies, components, and parts having identical part numbers shall, where practicable, meet the requirements for an interchangeable item as defined in paragraph 6.1.3.

### **.3.7 Safety**

The IMU shall not present non-controllable health hazards associated with electrical discharge, ionizing or non-ionizing radiation, noise, or other emissions. The IMU shall be designed such that no single failure or single operator error can result in a critical hazard. The Contractor shall document any hazards to provide a basis for reducing risk to an acceptable level, along with any necessary personnel protection procedures. No health hazards shall exist when the IMU is removed, maintained, installed, or in storage. The IMU and its associated ground

support equipment (GSE) shall be capable of being safely stored, handled, transported, installed, and checked out at all times prior to launch, in accordance with procedures agreed to between NRL and the Contractor.

#### **.4 Documentation**

Documentation shall be prepared according to the Contractor's established practices for spaceflight equipment. The documents shall meet the intent of NRL's internal methods and practices for control of spaceflight hardware. The results of trades studies, analyses, and development efforts shall be documented to support critical design decisions and milestone technical reviews during the course of the system development.

##### **.4.1 Specifications**

- a. Specifications shall be prepared in accordance with MIL-STD-961 and the appropriate Data Item Descriptions (DIDs) or their NRL-approved equivalents.
- b. Software specifications shall be prepared in accordance with NASA-STD-2100-91, IEEE/EIA 12207.0, IEEE/EIA 12207.1, IEEE/EIA 12207.2, or their NRL-approved equivalents.
- c. These documents shall be subject to change control procedures and every proposed engineering change shall consider the effect of that change on these documents so that compatibility is maintained.

##### **.4.2 Drawings**

- a. Specifications and hardware shall be supported by drawings in accordance with MIL-DTL-31000 or NRL-approved equivalent.
- b. The final system documentation shall be such that subsequent production items can be produced or procured that are essentially equivalent in all respects to those initially tested or delivered.
- c. This final documentation shall also be adequate to allow the rapid incorporation of changes and modifications that have been approved by the procuring activity.
- d. Documentation describing space segment operational procedures shall include contingency procedures to minimize the effect of possible on-orbit anomalies.

##### **.4.3 Test Plans and Procedures**

- a. All test plans and procedures shall be documented so that testing can be accomplished on site by skilled engineering personnel.
- b. Software test plans, descriptions, and procedures shall be prepared in accordance with NASA-STD-2100-91, IEEE/EIA 12207.0, IEEE/EIA 12207.1, and IEEE/EIA 12207.2.

##### **.4.4 Precedence**

The order of precedence of the requirements specified herein is:

- a. Safety;
- b. Mission;
- c. Design to cost;
- d. Performance;
- e. Quality factors; and
- f. All other requirements are considered equal in order of precedence.



## **4.0 QUALITY ASSURANCE PROVISIONS**

### **.1 General**

This section describes the analyses, tests, and inspections required for the IMU verification process. Verification of IMU design, construction, and performance will assure that the hardware and software conform to the requirements stated herein. The preferred method is test, where practical, to obtain empirical data to support verification. However, to meet program technical, schedule, and cost objectives, reuse of previously qualified flight equipment may dictate use of other verification methods (e.g., inspection, analysis, and review of design documentation). The analyses, tests, and inspections specified in Table 4-1 (included at the end of this section) will be conducted to verify that all requirements specified in Section 3.0 have been achieved.

#### **.1.1 Responsibility for Tests**

The Contractor will perform all or any of the verification requirements of this specification. Except as otherwise specified, the Contractor may use its own or any other facilities suitable for performance of the inspection and test requirements specified herein, unless disapproved by the government. The FAME PMO reserves the right to perform any tests or inspections set forth herein when deemed necessary to ensure that supplies and services conform to prescribed requirements. Ultimate responsibility for proper operation of each component or subsystem remains with the NRL subsystem manager.

### **.2 Quality Assurance Program Requirements**

The Contractor's quality assurance program shall provide control of the following areas:

- a. Reliability (paragraph 3.0.2.2.1);
- b. Parts, materials, and processes (paragraph 3.0.3.1);
- c. Workmanship (paragraph 3.0.3.5);
- d. Nonconforming material (paragraph .2.1); and
- e. Verification of design requirements (paragraph .3).

#### **.2.1 Control and Use of Nonconforming Material**

Non-conforming material shall not be used without NRL approval. All nonconforming material used in the final product shall be adequately documented. Nonconforming material shall be stored in a controlled area until disposition can be made.

### **.3 Verification and Verification Documentation**

The requirements of Section 3.0 shall be verified by one or more of the methods detailed in the Verification Requirements Checklist (Table 4-1).

- a. Similarity;
- b. Analysis;
- c. Inspection;
- d. Validation of Records;
- e. Demonstration and Measurement;
- f. Simulation;
- g. Review of Design Documentation; and
- h. Test.

Verification will be documented using the Verification Matrix. The matrix will include a separate record for each paragraph. Each record will include the requirement, verification description, compliance data, and approval block. All verification documentation will be made available to inspection, test, and assessment personnel. Applicable

verification drawings, specifications, and procedures will be physically located at the verification site at the time of the verification event.

### **.3.1 Verification by Similarity**

Verification by similarity is a method of verification that verifies a requirement based on existing results from components and assemblies of like kind and includes a review of prior relevant hardware configurations and applications. Hardware of similar design and manufacturing process that have been qualified to equivalent or more stringent specifications may be verified by similarity.

### **.3.2 Verification by Analysis**

A method of verification, taking the form of the processing and accumulated results and conclusions, intended to provide proof that verification of a requirement(s) has been accomplished. The analytical results may be based on engineering study, compilation or interpretation of existing information, similarity to previously verified requirements, or derived from lower level examinations, tests, demonstrations, or analyses. Analyses will be performed as specified in Table 4-1 to verify applicable requirements of Section 3.0. The analytical methods that may be used include engineering analyses in the specified technical discipline, similarity to a previously verified requirement, review of drawings and data, use of experience, or prior testing. When an analysis is specified in Table 4-1, a detailed engineering study to verify compliance with Section 3.0 of this document will be performed and documented.

### **.3.3 Verification by Inspection**

An element of verification consisting of investigation, without the use of special laboratory appliances or procedures, to determine compliance with requirements. Examination is nondestructive and includes (but is not limited to) visual inspection, simple physical manipulation, gauging and measurement. Inspections will be performed as specified in Table 4-1 to verify applicable requirements of Section 3.0. These inspections are to be performed before unit qualification or acceptance testing as part of the normal quality control inspection process.

### **.3.4 Validation of Records**

Validation of records is a method of verification that consists of a systematic review of all relevant records to demonstrate compliance with a requirement. This method occurs as part of the hardware and software buy-off process. For requirements verified by this method, the approved buy-off package will serve to certify verification.

### **.3.5 Demonstration or Measurement**

A method of verification that is limited to readily observable functional operation to determine compliance with requirements. This method will not require the use of special equipment or sophisticated instrumentation.

### **.3.6 Simulation**

Verification by simulation is a process of verifying a requirement through the use of a representative device or system that emulates the behavior of a device or system to be verified. This method is often used when direct measurements is not possible.

### **.3.7 Review of Design Documentation**

Verification by the review of design documentation is a method of verification that consists of a systematic review of design documentation to determine compliance with a requirement.

### **.3.8 Verification by Test**

A method of verification that employs technical means, including (but not limited to) the evaluation of functional operation by use of special equipment or instrumentation, simulation techniques and the application of established principles and procedures, to determine compliance with requirements. The analysis of data derived from test is an integral part of this verification method.

Verification performed by test will be conducted in accordance with NRL-approved test procedures. Criteria and procedures for critical parameters monitoring during test will be developed and include, as appropriate, test chamber temperature, test article temperature, pressure, test voltages and currents, test acoustic spectrum and level, test vibration spectrum and level, illumination, particle or radiation flux, instrument response and telemetry, and contamination. The FAME program will use the four types of tests specified below:

- a. Functional tests to verify in an abbreviated fashion that the unit or system is functioning;
- b. Performance tests to demonstrate and quantify the specified optical, electrical and/or mechanical performance parameters of the unit or system;
- c. Qualification tests to verify inherent functional performance capabilities in excess of the design requirements over the specified environment, including special interface qualification tests performed at Kennedy Space Center (KSC) or NRL using flight equivalent units; and
- d. Acceptance tests to gain confidence that each unit has achieved the inherent design capability verified on a sample basis.

### **.3.8.1 Functional/Performance Tests**

Functional or performance tests will be performed before, during, and after environmental exposures as part of the acceptance and qualification test sequences. This performance check will be made in accordance with approved test procedures. A record will be made of all data necessary to determine complete operational and performance characteristics.

### **.3.8.2 Environmental Tests**

#### **.3.8.2.1 Acceptance Tests**

Acceptance tests will be conducted to demonstrate acceptability of an item for movement to the next stage of testing or buy-off. Acceptance tests are intended to act as a quality screening and process control tool to detect deficiencies of workmanship, material, and quality. The following acceptance tests shall be performed as detailed in Table 4-1.

##### **.3.8.2.1.1 Physical Test**

The values and parameters specified in this specification for weight, center of gravity, moment of inertia, and envelope shall be verified.

##### **.3.8.2.1.2 Random Vibration**

Random vibration levels shall be at flight levels plus 3 dB, 1 minute duration in each of three axes. Testing shall be accomplished in each of three mutually perpendicular axes. Verification shall be conducted to assure compliance with paragraph 3.0.2.6.2.1.

##### **.3.8.2.1.3 Thermal Cycling**

The thermal cycling test demonstrates the ability of IMU components to operate under the anticipated temperature extremes plus a 5°C design margin and may reveal latent workmanship defects or marginal EEE parts. Components shall exhibit normal turn-on characteristics at the specified high and low temperatures. This shall be demonstrated during the last high and low temperature dwell after the IMU has been in an unpowered state for at least 0.5 hour. Additionally, functional tests shall be performed at the hot and cold dwells during the first and last cycle and after return of the IMU to ambient temperature. Thermal cycling requirements are shown in Figure 4-1.

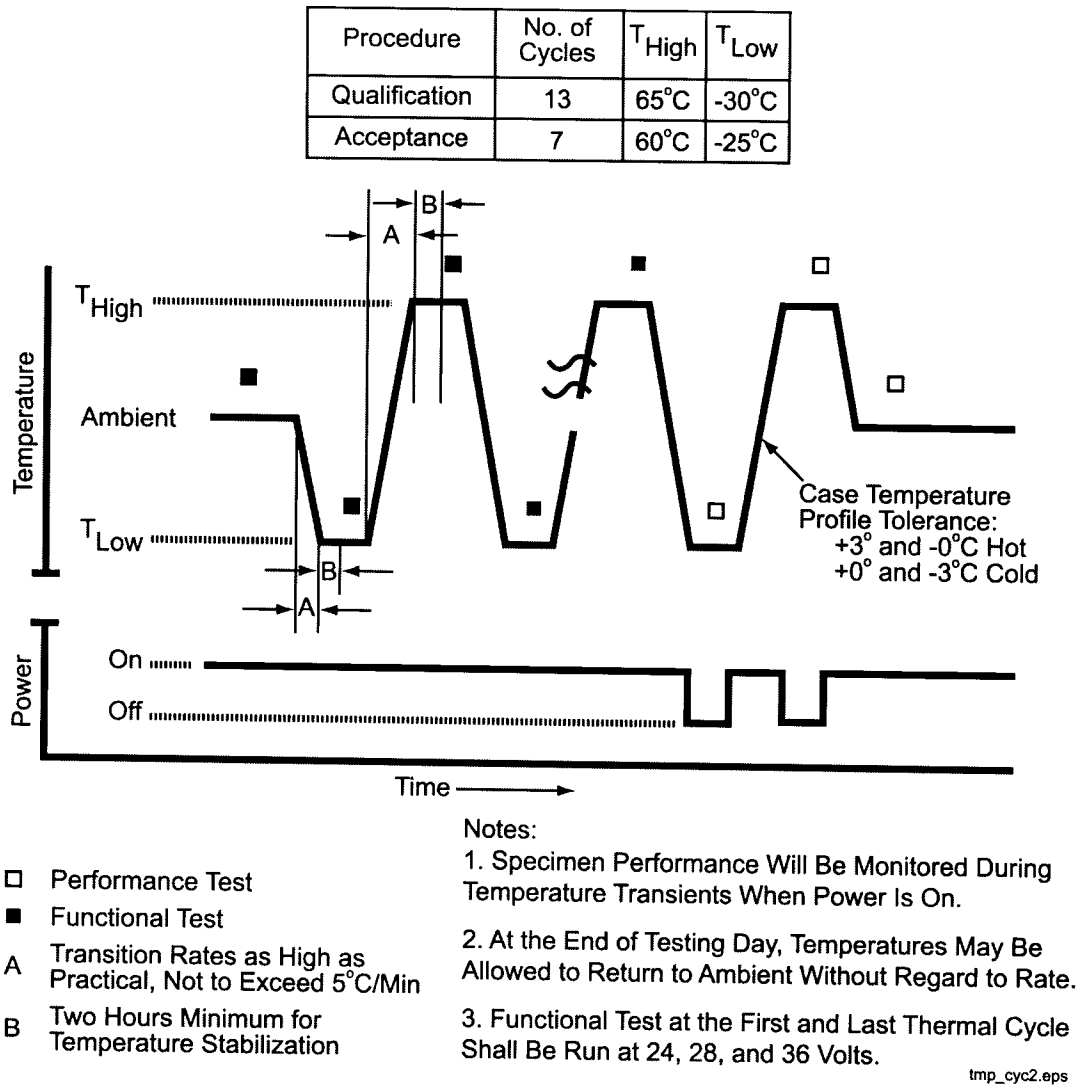


Figure 4-1. Thermal Cycling Profile

**.3.8.2.1.4 Thermal Vacuum**

Tests shall be conducted to verify compliance with this specification. Baseplate temperature limits shall be 5°C above and 5°C below flight temperature extremes. The pressure shall be  $1 \times 10^{-5}$  torr or less. The number of cycles shall be at least one and the dwell time at high and low temperature extremes shall not be less than 6 hours or the time required to verify subsystem performance. Critical parameter monitoring shall be accomplished during temperature transients. Thermal vacuum requirements are shown in Figure 4-2.

Procedure	No. of Cycles	T <sub>High</sub>	T <sub>Low</sub>
Qualification	3	+65°C	-30°C
Acceptance	1	+60°C	-25°C

□ Performance Test (Acceptance)

A Maintain System Temperature Until Interior Temperature Stabilizes

B Operate Over Flight Period

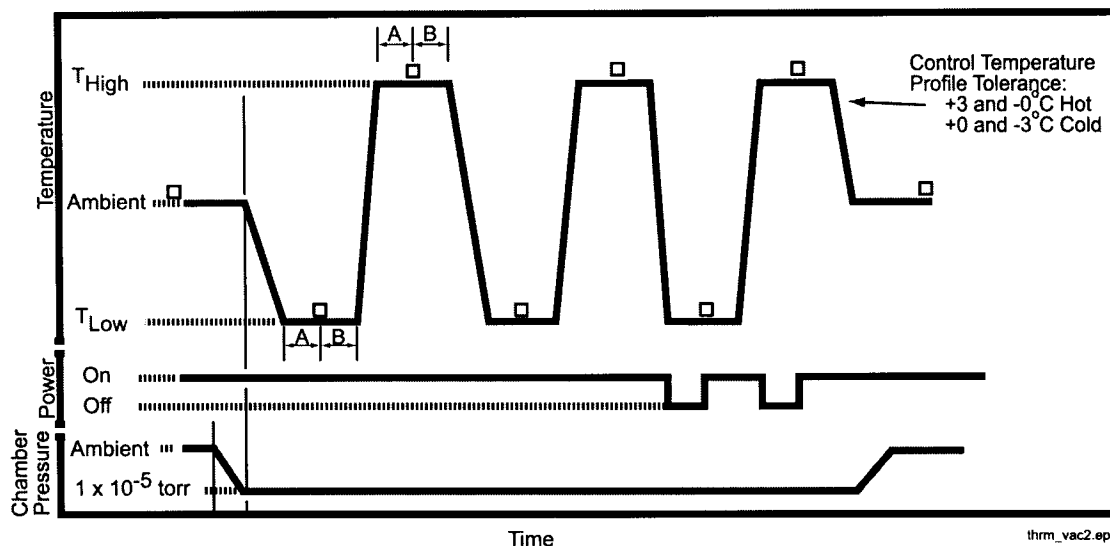


Figure 4-2. Thermal Vacuum Profile

#### .3.8.2.1.5 Burn-In Tests

The burn-in test shall be performed to reveal material or workmanship defects that may occur early in the life of the component. Burn-in testing shall only be required on EEE components containing active parts. The total operating time for component burn-in shall be 200 hours including the operating time during thermal and thermal-vacuum cycling. Additional test time beyond that required for thermal cycling shall be conducted at ambient temperatures. The final 50 hours of the component burn-in test shall be failure-free.

#### .3.8.2.2 Qualification Tests

Qualification tests will be conducted to demonstrate that the design and manufacturing methods used in the construction of the IMU have resulted in an item that meets the specified requirements and has suitable margins when exposed to the expected operating environments. The following qualification tests shall be performed as detailed in the Verification Requirements Checklist (Table 4-1).

##### .3.8.2.2.1 Random Vibration

Random vibration levels shall be at flight levels plus 6dB, 2 minute duration in each of three axes. Testing shall be accomplished in each of three mutually perpendicular axes. Verification shall be conducted to assure compliance with paragraph 3.0.2.6.2.1.

##### .3.8.2.2.2 Pyrotechnic Shock

The pyroshock test shall demonstrate the capability of the component to withstand the expected pyrotechnic shock environment. The test may be conducted at the IMU or after integration at the spacecraft (system) level by actuating devices that produce shock external to the IMU. Verification shall be conducted to assure compliance with paragraph 3.0.2.6.2.1.

**.3.8.2.2.3 Thermal Stability**

Tests shall be conducted to verify that the IMU alignments remain within the stated requirement during expected thermal states.

**.3.8.2.2.4 Thermal Cycling**

The thermal cycling test demonstrates the ability of IMU components to operate under the anticipated temperature extremes plus an 10°C design margin and may reveal latent workmanship defects or marginal EEE parts. Components shall exhibit normal turn-on characteristics at the specified high and low temperatures. This shall be demonstrated during the last high and low temperature dwell after the IMU has been in an unpowered state for at least 0.5 hour. Additionally, functional tests shall be performed at the hot and cold dwells during the first and last cycle and after return of the IMU to ambient temperature. Thermal cycling requirements are shown in Figure 4-1.

**.3.8.2.2.5 Thermal Vacuum**

The thermal vacuum test demonstrates the capability of the IMU to perform in a thermal vacuum environment that simulates the design environment extremes plus a 10°C design margin. Tests shall be conducted to verify compliance with paragraph 3.0.2.6.2.2.1. Critical parameter monitoring shall be accomplished during temperature transients. Thermal vacuum requirements are shown in Figure 4-2.

**.3.8.2.2.6 Electromagnetic Interference/Electromagnetic Compatibility (EMI/EMC)**

The EMI/EMC test demonstrates that the electromagnetic interference characteristics (emission and susceptibility) of the component under normal operating conditions does not result in malfunction or the IMU, and that the component does not emit, radiate, or conduct interference that results in malfunction of other system components. Tests shall be conducted to verify compliance with paragraph 3.0.3.2.

**.3.9 Verification of Safety Requirements**

Safety related requirements will be verified as part of the range safety process.

Table 4-1. Verification Requirements Checklist

Requirement		Verification Method									
Paragraph No.	Title	N o t  A p p l i c a b l e	S i l l a r i t y	A n a l y s i s	I n s p e c t i o n	V a l i d a t i o n  o f  R e c o r d s	D e m o n s t r a t i o n  o r  M e a s u r e m e n t	S i m u l a t i o n	R e v i e w o f D e s i g n  D o c u m e n t a t i o n	A c c e p t a n c e T e s t	Q u a l i f i c a t i o n T e s t
3.0	REQUIREMENTS	X									
3.1	Item Definition	X									
3.1.1	Interface Definition								X		
3.2	Characteristics	X									
3.2.1	Performance Requirements	X									
3.2.1.1	Gyroscope Performance	X									
3.2.1.1.1	General								X		
3.2.1.1.2	Maximum Continuous Input Rates									X	
3.2.1.1.3	Output Scale Factors									X	
3.2.1.1.3.1	Scale Factor Linearity									X	
3.2.1.1.3.2	Scale Factor Stability									X	
3.2.1.1.4	Bias Repeatability									X	
3.2.1.1.5	Angular Random Walk									X	
3.2.1.1.6	Bandwidth									X	
3.2.1.1.7	Axis Alignment									X	
3.2.1.1.8	Sensitivity									X	
3.2.1.1.9	Warm-up Time									X	

Requirement		Verification Method									
Paragraph No.	Title	N o t  A p p l i c a b l e	S i l a r i t y	A n a l y s i s	I n s p e c t i o n	V a l i d a t i o n  o f  R e c o r d s	D e m o n s t r a t i o n  o r  M e a s u r e m e n t	S i u l a t i o n	R e v i e w o f D e s i g n  D o c u m e n t a t i o n	A c c e p t a n c e T e s t	Q u a l i f i c a t i o n T e s t
3.2.1.2	Accelerometer Performance	X									
3.2.1.2.1	General	X									
3.2.1.2.2	Maximum Continuous Acceleration									X	
3.2.1.2.3	Scale Factor Accuracy									X	
3.2.1.2.4	Bias Accuracy									X	
3.2.1.2.5	Bandwidth									X	
3.2.1.2.6	Axis Alignment									X	
3.2.1.2.7	Least Significant Bit (LSB)									X	
3.2.1.2.8	Warm-up Time									X	
3.2.1.3	Output Data Interfaces								X		
3.2.1.3.1	Output Data								X		
3.2.1.3.2	IMU Output Sampling Period								X		
3.2.1.4	Primary Power	X									
3.2.1.4.1	Conditioned Power (Alternate #1)									X	
3.2.1.4.2	Primary Power (Alternate #2)									X	
3.2.1.4.2.1	Input Voltage									X	
3.2.1.4.2.2	Source Impedance									X	
3.2.1.4.2.3	Isolation									X	
3.2.1.4.2.4	Power Consumption									X	
3.2.1.4.2.5	Inrush Current									X	



Requirement		Verification Method									
Paragraph No.	Title	N o t  A p p l i c a b l e	S i l a r i t y	A n a l y s i s	I n s p e c t i o n	V a l i d a t i o n  o f  R e c o r d s	D e m o n s t r a t i o n  o r  M e a s u r e m e n t	S i m u l a t i o n	R e v i e w  o f  D e s i g n  D o c u m e n t a t i o n	A c c e p t a n c e  T e s t	Q u a l i f i c a t i o n  T e s t
3.2.2	Physical Characteristics	X									
3.2.2.1	Mass Properties Control and Reporting					X					
3.2.2.1.1	Weight Limits				X						
3.2.2.2	Dimensions and Envelope				X						
3.2.2.3	Coordinate System			X							
3.2.2.4	Minimum Frequency			X							
3.2.2.5	Center of Gravity (CG) Limits			X							
3.2.3	System Quality Factors	X									
3.2.3.1	Reliability			X							
3.2.3.2	Failure Modes, Effects, and Criticality Analysis			X							
3.2.3.3	Electrical Stress Analysis			X							
3.2.3.4	Worst Case Analysis			X							
3.2.3.5	Radiation Analysis			X							
3.2.4	Maintainability	X									
3.2.5	Fault Detection Capability								X		
3.2.6	Environmental Conditions	X									
3.2.6.1	Non-Operating Environment	X									
3.2.6.1.1	Integration and Test Facility Environment			X							
3.2.6.1.2	Ground Handling and Transportation			X							
3.2.6.1.3	Prelaunch			X							
3.2.6.2	Operating Environment	X									

Requirement		Verification Method									
Paragraph No.	Title	N o t  A p p l i c a b l e	S i l a r i t y	A n a l y s i s	I n s p e c t i o n	V a l i d a t i o n  o f  R e c o r d s	D e m o n s t r a t i o n  o r  M e a s u r e m e n t	S i m u l a t i o n	R e v i e w o f  D e s i g n  D o c u m e n t a t i o n	A c c e p t a n c e  T e s t	Q u a l i f i c a t i o n  T e s t
3.2.6.2.1	Launch and Ascent									X	X
3.2.6.2.2	Orbital Operations	X									
3.2.6.2.2.1	Temperature			X							
3.2.6.2.2.2	Pressure			X							
3.2.6.2.2.3	Particle Radiation			X							
3.2.6.2.2.3.1	Total Ionizing Dose			X							
3.2.6.2.2.3.2	Single Event Effects			X							
3.2.6.2.2.3.2.1	Single Event Induced Destructive Failure			X							
3.2.6.2.2.3.2.2	Single Event Induced Non-Destructive Failures			X							
3.2.6.2.2.3.2.3	Single Event Induced Soft Errors			X							
3.2.6.2.2.4	Acceleration	X									
3.2.6.2.2.5	Pyrotechnic Shock	X									
3.2.6.2.2.6	Random Vibration	X									
3.2.7	Transportability	X									
3.2.7.1	Packaging and Transportation			X							
3.2.7.2	Marking	X									
3.3	Design and Construction	X									
3.3.1	Parts, Materials, and Processes			X					X		
3.3.1.1	Parts	X									
3.3.1.1.1	EEE Standard Parts Selection Criteria			X					X		

Requirement		Verification Method									
Paragraph No.	Title	N o t  A p p l i c a b l e	S i l l a r i t y	A n a l y s i s	I n s p e c t i o n	V a l i d a t i o n  o f  R e c o r d s	D e m o n s t r a t i o n  o r  M e a s u r e m e n t	S i m u l a t i o n	R e v i e w o f  D e s i g n  D o c u m e n t a t i o n	A c c e p t a n c e  T e s t	Q u a l i f i c a t i o n  T e s t
3.3.1.1.2	EEE Parts Procurement, Processing, and Screening			X					X		
3.3.1.1.3	EEE Parts Stress Derating			X					X		
3.3.1.1.4	Electrostatic Discharge Sensitive EEE Parts				X				X		
3.3.1.2	Materials	X									
3.3.1.2.1	Outgassing			X					X		
3.3.1.2.2	Structural and Metallic Materials				X				X		
3.3.1.2.3	Magnetic Materials			X					X		
3.3.1.2.4	Finishes				X				X		
3.3.1.2.5	Toxic Products and Formulations				X				X		
3.3.1.2.6	Stress Corrosion				X				X		
3.3.1.2.7	Polymer Materials				X				X		
3.3.1.3	Processes	X									
3.3.1.3.1	Soldering and Other Processes				X				X		
3.3.1.3.2	Traceability Process				X				X		
3.3.1.3.3	Failure Reporting and Corrective Action System			X	X						
3.3.2	Electromagnetic Environment	X									
3.3.2.1	Conducted Emission										X
3.3.2.2	Conducted Susceptibility										X
3.3.2.3	Radiated Emissions.	X									
3.3.2.3.1	Narrowband Emissions										X

Requirement		Verification Method									
Paragraph No.	Title	N o t  A p p l i c a b l e	S i l a r i t y	A n a l y s i s	I n s p e c t i o n	V a l i d a t i o n  o f  R e c o r d s	D e m o n s t r a t i o n  o r  M e a s u r e m e n t	S i m u l a t i o n	R e v i e w  o f  D e s i g n  D o c u m e n t a t i o n	A c c e p t a n c e  T e s t	Q u a l i f i c a t i o n  T e s t
3.3.2.3.2	Broadband Emissions	X									
3.3.2.4	Radiated Susceptibility	X									
3.3.2.4.1	Narrowband Susceptibility										X
3.3.2.4.2	Broadband Susceptibility	X									
3.3.3	Corona Suppression			X							
3.3.4	Nameplate and Product Marking				X						
3.3.5	Workmanship				X						
3.3.6	Interchangeability			X							
3.3.7	Safety			X							
3.4	Documentation	X									
3.4.1	Specifications				X				X		
3.4.2	Drawings				X				X		
3.4.3	Test Plans and Procedures				X				X		
3.4.4	Precedence	X									

## **5.0 PREPARATION FOR DELIVERY**

This section provides guidance for preparing the IMU for delivery.

### **.1 Packaging and Transportation**

Packaging and transportation of the IMU for delivery shall be in accordance with paragraph 3.0.2.6.2.2.4.

### **.2 Containers**

The Contractor shall use customer approved industry standard containers for aerospace electronics suitable for hand carrying the packaged item.

## **6.0 Deliverables and Tasks**

### **.1 Monthly Status Reports**

The Contractor shall provide a monthly status report via DD Form 1423, Contract Data Requirements List (CDRL) A001, identifying progress to date, planned efforts for the next reporting period, and program issues and problems.

### **.2 Program Support Documentation**

The Contractor shall provide the necessary planning and schedule to meet the delivery requirements. The Contractor shall comment on any potential problems in the schedule and provide a detailed plan of attack for solving those problems. A detailed schedule must be prepared, maintained, and provided to the COR, with schedule changes and/or updates provided. The data shall be provided monthly starting 30 days after award of contract (DAC) via DD Form 1423, A001. The Contractor shall inform the COR within seven days of any and all events or delays at the Contractor's facility that may impact schedule, performance, quality, delivery, or cost. If any delays occur or are anticipated to occur, the Contractor shall notify the COR by phone, following up with a written notification to the Contract Negotiator (identified in Section G of the contract). The Contractor shall provide a copy of the written notification to the COR.

### **.3 Interface Control Document**

The IMU Interface Control Document (ICD), DD Form 1423, A009, shall provide all of the electrical and mechanical interfaces for the IMU. This shall include schematics, timing diagrams, pinouts, and command and control requirements. The Contractor shall deliver a complete ICD 45 days after contract.

### **.4 Design Packages**

#### **.4.1 Preliminary Design Review Package**

A Preliminary Design Review (PDR) package, DD Form 1423, A002, consisting of engineering drawings, schematics, analyses, and schedule in accordance with this specification, shall be furnished to the COR seven days prior to the scheduled PDR. A summary of actions and action items resulting from the PDR shall be furnished to the COR within two weeks after the PDR.

#### **.4.2 Final Design Review Package**

A Final Design Review (FDR) package, DD Form 1423, A003, consisting of engineering drawings, schematics, analyses, and schedule in accordance with this specification, shall be furnished to the COR seven days prior to the FDR. A summary of actions and action items resulting from the FDR shall be furnished to the COR within two weeks after the FDR.

#### **.4.3 Drawings**

##### **.4.3.1 Assembly**

The Contractor shall deliver a complete set of all assembly drawings for the IMU, DD Form 1423, A004, at PDR. If changes to the drawings are required, revised drawings will be sent to the COR.

##### **.4.3.2 Schematics and Parts List**

The Contractor shall deliver a complete parts list for the IMU, DD Form 1423, A005, along with annotated schematics at PDR. If any changes are required, a revised parts list and annotated schematics will be sent to the COR.

##### **.4.3.3 Engineering Changes**

The IMU shall be fabricated and assembled in accordance with drawings, parts lists, processes, and other documents listed on Contractor drawings. These documents shall be submitted to and approved by the COR. Upon establishment of the baseline configuration between the Contractor and the COR, the Contractor shall make no

changes to any of these without written approval from the COR via a Change Control Notice (CCN). When changes need to be made they will be provided according to DD Form 1423, A006.

**.5 Testing Packages**

**.5.1 Test Procedures**

Test procedures, DD Form 1423, A007, shall be prepared by the Contractor and submitted for COR approval 30 days prior to testing.

**.5.2 Test Reports**

Test reports, DD Form 1423, A008, shall be generated by the Contractor and submitted upon final delivery of the unit tested. Test reports shall document all test failures and anomalies. Test reports shall include assembly and test log books. A Certificate of Compliance with the specification shall be provided with the test reports and unit tested.

**.6 System Effectiveness**

**.6.1 Worst Case Analysis**

The Contractor shall deliver a worst case analysis 180 days after contract award, per DD Form 1423, A010.

**.6.2 Electrical Stress Analysis**

The Contractor shall deliver a stress analysis 180 days after contract award, per DD Form 1423, A011.

**.6.3 Worst Case Timing Analysis**

The Contractor shall deliver a worst case timing analysis 180 days after contract award, per DD Form 1423, A012.

**.6.4 Reliability Analysis**

The Contractor shall deliver a reliability analysis 180 days after contract award, per DD Form 1423, A013.

**.6.5 Failure Modes and Effects Criticality Analysis**

The Contractor shall deliver a failure modes and effects criticality analysis 180 days after contract award, per DD Form 1423, A014.

**.6.6 Radiation Analysis**

The Contractor shall deliver a radiation analysis 180 days after contract award, per DD Form 1423, A015.

**.7 Tasks**

**.7.1 Kick-Off Meeting**

The Kick-Off Meeting will be held at the Contractor's facility by 14 days after contract award.

**.7.2 Preliminary Design Meeting**

The Preliminary Design Review will be held at the Contractor's facility 60 days after contract award.

**.7.3 Final Design Review**

The Final Design Review will be held at the Contractor's facility 30 days prior to start of testing.

## 7.0 NOTES

This section provides additional information that is not contractually binding. Included are a glossary and list of acronyms.

### .1 Definitions

#### .1.1 Contractor

A Contractor shall be an organization awarded a contract to supply a product or service.

#### .1.2 Production Hardware

Hardware fabricated and inspected to production drawings, identical in performance, configuration, and fabrication to the article to be flown.

#### .1.3 Interchangeable Items

When two or more items possess such functional and physical characteristics as to be equivalent in performance and durability and are capable of being exchanged one for the other without alteration of the items themselves or of adjoining items except for adjustment, and without selection for fit or performance, the items are interchangeable.

#### .1.4 Replacement Item

An item that is functionally interchangeable with another item, but which differs physically from the original part in that the installation of the replacement part requires operations such as drilling, reaming, cutting, filing, shimming, etc. in addition to the normal applications and methods of attachment.

#### .1.5 Part

One piece or two or more pieces joined together that are not normally subject to disassembly without destruction of designed use.

#### .1.6 Device

Electromechanical or mechanical items that perform a specific function and are intermediate in complexity between piece parts and components. For example: valves, small motors, relays, gyros, connectors, vidicon tubes, batteries, etc.

#### .1.7 Component

A combination of parts, devices, and structures, usually self-contained, that perform a distinctive function in the operation of the overall equipment; i.e., a "black box."

#### .1.8 Operating Failure Rate

The operating failure rate represents a mathematical combination of failure rates associated with a part's failure modes that may occur in an operation sequence under laboratory conditions.

#### .1.9 Cycle

A cycle (e.g., thermal vacuum testing) shall be defined as the transition from a nominal to a positive or negative extreme, and the transition to the opposite extreme and back to nominal.

### .2 Acronyms and Abbreviations

AKM	Apogee Kick Motor
CCN	Configuration Change Notice
CDR	Critical Design Review
CDRL	Contract Data Requirements List
CG	Center of Gravity



COR	Contracting Officer's Representative
CT&DH	Command, Telemetry, and Data Handling
CVCM	Collected Volatile Condensable Material
DAC	Days After Contract
DID	Data Item Description
DPA	Destructive Physical Analysis
EDAC	Error Detection and Correction
EEE	Electrical, Electronic, and Electromechanical
ELV	Expendable Launch Vehicle
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EPS	Electrical Power System
FAME	Full-sky Astrometric Mapping Explorer
FDR	Final Design Review
FMECA	Failure Modes, Effects, and Criticality Analysis
FOV	Field of View
FRACAS	Failure Reporting and Corrective Action System
GIDEP	Government-Industry Data Exchange Program
GSE	Ground Support Equipment
I&T	Integration and Test
ICD	Interface Control Document
IMU	Inertial Measurement Unit
KSC	Kennedy Space Center
LET	Linear Energy Transfer
LSB	Least Significant Bit
MIDEX	Medium Class Explorer
NRL	Naval Research Laboratory
PCB	Printed Circuit Board
PDR	Preliminary Design Review
PIND	Particle Impact Noise Detection
PMO	Project Management Office
PMP	Parts, Materials, and Processes
PWB	Printed Wiring Board
QML	Qualified Materials List
QPL	Qualified Parts List
SEE	Single Event Effects
SEFI	Single Event Functional Interrupt
SEL	Single Event Latchup
SEU	Single Event Upset
SPE	Solar Particle Event
T&C	Telemetry and Command
TID	Total Ionizing Dose
TML	Total Mass Loss

# CONTRACT DATA REQUIREMENTS LIST

(1 Data Item)

Form Approved  
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 110 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503. Please DO NOT RETURN your form to either of these addresses. Send completed form to the Government Issuing Contracting Officer for the Contract/PR No. listed in Block E.

<b>A. CONTRACT LINE ITEM NO.</b> 0002		<b>B. EXHIBIT</b> A		<b>C. CATEGORY:</b> TOP _____ TM _____ OTHER _____							
<b>D. SYSTEM / ITEM</b>			<b>E. CONTRACT / PR NO.</b> N00173-01-R-RS02		<b>F. CONTRACTOR</b> (To Be Provided At Contract Award)						
<b>1. DATA ITEM NO.</b> A001		<b>2. TITLE OF DATA ITEM</b> MONTHLY COST AND PERFORMANCE REPORT			<b>3. SUBTITLE</b>						
<b>4. AUTHORITY (Data Acquisition Document No.)</b>			<b>5. CONTRACT REFERENCE</b> CLIN 0002 and Contract References		<b>6. REQUIRING OFFICE</b> NRL Code:						
<b>7. DD 250 REQ</b> LT		<b>9. DIST STATEMENT REQUIRED</b>		<b>10. FREQUENCY</b> See Blk. 16		<b>12. DATE OF FIRST SUBMISSION</b>					
<b>8. APP CODE</b>				<b>11. AS OF DATE</b> See Blk. 16		<b>13. DATE OF SUBSEQUENT SUBMISSION</b>					
<b>14. DISTRIBUTION</b>						<b>a. ADDRESSEE</b>		<b>b. COPIES</b>			
								Draft		Final	
<b>15. REMARKS</b> The Contractor shall provide a Monthly Cost and Performance Report to the COR on a Monthly frequency beginning 30 days after contract award. DD 250 requirements shall be on an LT basis. The report may be in the Contractor's format and, as a minimum, shall contain the following information:  (1) Contract Number (2) Reporting Period covered by Report (3) Total amount funded for Contract (4) Total amount invoiced to date, including a breakdown by ACRNs prorated in proportion to the unliquidated balance (5) Total amount invoiced for this reporting period (6) Estimated cost to complete, with explanation if more than total amount funded (7) Schedule status, indicating if efforts are on schedule or not, with explanations for delays and projected impact of delays (8) Contractor hours expended on NRL property, if any, including employee names, number of hours works, and specific contract task involved (9) Technical Progress, including a brief narrative on technical progress made, significant accomplishments, meetings attended, etc. (10) Briefs/Reports generated (11) Travel Activity (12) Plans for next month (13) Technical problem areas and potential solutions						COR		2			
						ACO (trx. letter only)					
<b>15. TOTAL</b>						2					
<b>G. PREPARED BY</b> Richard D. Sewell			<b>H. DATE</b> 17 MAY 2001		<b>I. APPROVED BY</b>		<b>J. DATE</b>				

<b>17. PRICE GROUP</b>
<b>18. ESTIMATED TOTAL PRICE</b>

**Form Approved**  
**OMB No. 0704-0188**

Public reporting burden for this collection of information is estimated to average 110 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503. Please DO NOT RETURN your form to either of these addresses. Send completed form to the Government Issuing Contracting Officer for the Contract/PR No. listed in Block E.

**17. PRICE GROUP**

**18. ESTIMATED  
TOTAL PRICE**

# CONTRACT DATA REQUIREMENTS LIST

(1 Data Item)

Form Approved  
OMB No. 0704-0188

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<b>A. CONTRACT LINE ITEM NO.</b> 0002		<b>B. EXHIBIT</b> A		<b>C. CATEGORY:</b> TDP _____ TM _____ OTHER _____							
<b>D. SYSTEM / ITEM</b>		<b>E. CONTRACT / PR NO.</b> N00173-01-R-RS02		<b>F. CONTRACTOR</b> (To Be Provided At Contract Award)							
<b>1. DATA ITEM NO.</b> A003	<b>2. TITLE OF DATA ITEM</b> DRAWINGS			<b>3. SUBTITLE</b>							
<b>4. AUTHORITY (Data Acquisition Document No.)</b>		<b>5. CONTRACT REFERENCE</b> CLIN 0002 and Contract References		<b>6. REQUIRING OFFICE</b> NRL Code:							
<b>7. DD 250 REQ</b> LT/DD	<b>9. DIST STATEMENT REQUIRED</b>	<b>10. FREQUENCY</b> See Blk. 16	<b>12. DATE OF FIRST SUBMISSION</b> See Blk. 16	<b>14. DISTRIBUTION</b>							
<b>8. APP CODE</b>		<b>11. AS OF DATE</b>	<b>13. DATE OF SUBSEQUENT SUBMISSION</b>	<b>a. ADDRESSEE</b>	<b>b. COPIES</b>						
					<table border="1"><tr><th>Draft</th><th colspan="2">Final</th></tr><tr><td></td><td>Reg</td><td>Repro</td></tr></table>	Draft	Final			Reg	Repro
Draft	Final										
	Reg	Repro									
<b>16. REMARKS</b> The Contractor shall provide Assembly Drawings, Schematics and Parts List Drawings, and Engineering Change Drawings, in accordance with the requirements below:  (A) Assembly Drawings. Reference Contract Section C and paragraph 6.4.3.1 of Attachment 1. The Contractor shall provide Assembly Drawings to the COR on a ONR/R frequency at least 7 days prior to the preliminary design review. DD 250 requirement shall be on a DD basis.  (B) Schematics and Parts List Drawings. Reference Contract Section C and paragraph 6.4.3.2 of Attachment 1. The Contractor shall provide Schematic and Parts List Drawings to the COR on a ONE/R frequency at least 7 days prior to the preliminary design review. DD 250 requirement shall be on a DD Basis.  (C) Engineering Changes Drawings. Reference Contract Section C and paragraph 6.4.3.3 of Attachment 1. The Contractor shall provide Engineering Change Drawings to the COR on an ASREQ frequency. DD 250 requirement shall be on an LT basis.				COR	2						
				ACO (trx. letter only)							
								<b>15. TOTAL</b>	2		
				<b>G. PREPARED BY</b> Richard D. Sewell		<b>H. DATE</b> 17 MAY 2001		<b>I. APPROVED BY</b>			
				<b>J. DATE</b>							

<b>17. PRICE GROUP</b>
<b>18. ESTIMATED TOTAL PRICE</b>

# CONTRACT DATA REQUIREMENTS LIST

(1 Data Item)

Form Approved  
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Public reporting burden for this collection of information is estimated to average 110 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503. Please DO NOT RETURN your form to either of these addresses. Send completed form to the Government Issuing Contracting Officer for the Contract/PR No. listed in Block E.

<b>A. CONTRACT LINE ITEM NO.</b> 0002		<b>B. EXHIBIT</b> A		<b>C. CATEGORY:</b> TDP _____ TM _____ OTHER _____	
<b>D. SYSTEM / ITEM</b>		<b>E. CONTRACT / PR NO.</b> N00173-01-R-RS02		<b>F. CONTRACTOR</b> (To Be Provided At Contract Award)	
<b>1. DATA ITEM NO.</b> A004	<b>2. TITLE OF DATA ITEM</b> TECHNICAL ANALYSES			<b>3. SUBTITLE</b>	
<b>4. AUTHORITY (Data Acquisition Document No.)</b>		<b>5. CONTRACT REFERENCE</b> CLIN 0002 and Contract References		<b>6. REQUIRING OFFICE</b> NRL Code:	
<b>7. DD 250 REQ</b> DD	<b>9. DIST STATEMENT REQUIRED</b>	<b>10. FREQUENCY</b> See Blk. 16	<b>12. DATE OF FIRST SUBMISSION</b>	<b>14. DISTRIBUTION</b>	
<b>8. APP CODE</b>		<b>11. AS OF DATE</b> See Blk. 16	<b>13. DATE OF SUBSEQUENT SUBMISSION</b>	<b>a. ADDRESSEE</b>	<b>b. COPIES</b>
<b>16. REMARKS</b> The Contractor shall provide Worst Case Analysis, Electrical Stress Analysis, Worst Case Timing Analysis, Reliability Analysis, Failure Modes and Effects Criticality Analysis, and Radiation Analysis, in accordance with the requirements stated below.  (A) Worst Case Analysis. Reference Contract Section C and paragraph 6.6.1 of Attachment 1. The Contractor shall provide a Worst Case Analysis to the COR on a OTIME frequency not later than 6 months after contract award. DD 250 requirement shall be on a DD basis.  (B) Electrical Stress Analysis. Reference Contract Section C and paragraph 6.6.2 of Attachment 1. The Contractor shall provide an Electrical Stress Analysis to the COR on a OTIME frequency not later than 6 months after contract award. DD 250 requirements shall be on a DD basis.  (C) Worst Case Timing Analysis. Reference Contract Section C and paragraph 6.6.3 of Attachment 1. The Contractor shall provide a Worst Case Timing Analysis to the COR on a OTIME frequency not later than 6 months after contract award. DD 250 requirement shall be on a DD basis.  (D) Reliability Analysis. Reference Contract Section C and paragraph 6.6.4 of Attachment 1. The Contractor shall provide a Reliability Analysis to the COR on a OTIME frequency not later than 6 months after contract award. DD 250 requirements shall be on a DD basis.  (E) Failure Modes and Effects Criticality Analysis. Reference Contract Section C and paragraph 6.6.5 of Attachment 1. The Contractor shall provide Failure Modes and Effects Criticality Analysis to the COR on a OTIME frequency not later than 180 days after contract award. DD 250 requirements shall be on a DD basis.  (F) Radiation Analysis. Reference Contract Section C and paragraph 6.6.6 of Attachment 1. The Contractor shall provide Radiation Analysis to the COR on a OTIME frequency not later than 180 days after contract award. DD 250 requirements shall be on a DD basis.				<b>15. TOTAL</b>	<b>17. PRICE GROUP</b>
<b>G. PREPARED BY</b> Richard D. Sewell		<b>H. DATE</b> 17 MAY 2001		<b>I. APPROVED BY</b>	
				<b>J. DATE</b>	

# CONTRACT DATA REQUIREMENTS LIST

(2 Data Items)

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Public reporting burden for this collection of information is estimated to average 220 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503. Please DO NOT RETURN your form to either of these addresses. Send completed form to the Government Issuing Contracting Officer for the Contract/PR No. listed in Block E.

<b>A. CONTRACT LINE ITEM NO.</b> 0002		<b>B. EXHIBIT</b> A		<b>C. CATEGORY:</b> TDP _____ TM _____ OTHER _____	
<b>D. SYSTEM / ITEM</b>		<b>E. CONTRACT / PR NO.</b> N00173-01-R-RS02		<b>F. CONTRACTOR</b> (To Be Provided at Contract Award)	
<b>1. DATA ITEM NO.</b> A005		<b>2. TITLE OF DATA ITEM</b> TESTING PROCEDURES AND REPORTS		<b>3. SUBTITLE</b>	
<b>4. AUTHORITY (Data Acquisition Document No.)</b>		<b>5. CONTRACT REFERENCE</b> CLIN 0002 and Contract References		<b>6. REQUIRING OFFICE</b> NRL Code:	
<b>7. DD 250 REQ</b> DD	<b>8. DIST STATEMENT REQUIRED</b>	<b>10. FREQUENCY</b> See Block 16	<b>12. DATE OF FIRST SUBMISSION</b>	<b>14. DISTRIBUTION</b>	
<b>9. APP CODE</b>		<b>11. AS OF DATE</b> See Block 16	<b>13. DATE OF SUBSEQUENT SUBMISSION</b>	<b>a. ADDRESSEE</b>	<b>b. COPIES</b>
<b>16. REMARKS</b> <p>The Contractor shall provide Testing Procedures and Testing Reports in accordance with the requirements stated below:</p> <p>(1) Testing Procedures. Reference Contract Section C and paragraph 6.5.1 of Attachment 1. The Contractor shall provide Testing Procedures documentation to the COR on a OTIME frequency at least 14 days prior to test. DD 250 requirements shall be on a DD basis.</p> <p>(2) Test Reports. Reference Contract Section C and paragraph 6.5.2 of Attachment 1. The Contractor shall provide Test Reports to the COR on a OTIME frequency not later than 14 days after test completion. DD 250 requirements shall be on a DD basis.</p>				<b>Draft</b>	<b>Final</b>
				<b>15. TOTAL</b> →	

<b>1. DATA ITEM NO.</b> A006		<b>2. TITLE OF DATA ITEM</b> INTERFACE CONTROL DOCUMENT		<b>3. SUBTITLE</b>	
<b>4. AUTHORITY (Data Acquisition Document No.)</b>		<b>5. CONTRACT REFERENCE</b> CLIN 0002 and Contract References		<b>6. REQUIRING OFFICE</b> NRL Code:	
<b>7. DD 250 REQ</b> DD	<b>8. DIST STATEMENT REQUIRED</b>	<b>10. FREQUENCY</b> See Block 16	<b>12. DATE OF FIRST SUBMISSION</b>	<b>14. DISTRIBUTION</b>	
<b>9. APP CODE</b>		<b>11. AS OF DATE</b> See Block 16	<b>13. DATE OF SUBSEQUENT SUBMISSION</b>	<b>a. ADDRESSEE</b>	<b>b. COPIES</b>
<b>16. REMARKS</b> <p>Reference Contract Section C and paragraph 6.3 of Attachment 1.</p> <p>The Contractor shall provide an Interface Control Document to the COR on a ONE/R frequency not later than 45 days after contract award. DD 250 requirements shall be on a DD basis.</p>				<b>Draft</b>	<b>Final</b>
<b>15. TOTAL</b> →				2	

<b>G. PREPARED BY</b> Richard D. Sewell		<b>H. DATE</b> 17 MAY 2001	<b>I. APPROVED BY</b>	<b>J. DATE</b>
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<b>17. PRICE GROUP</b>
<b>18. ESTIMATED TOTAL PRICE</b>

<b>17. PRICE GROUP</b>
<b>18. ESTIMATED TOTAL PRICE</b>

**ATTACHMENT 2**

**ACCOUNTING AND APPROPRIATION DATA**

(TO BE PROVIDED AT TIME OF AWARD)